

ECLECTIC SERIES

KEY
TO
RAY'S
NEW
ARITHMETICS
INTELLECTUAL AND PRACTICAL

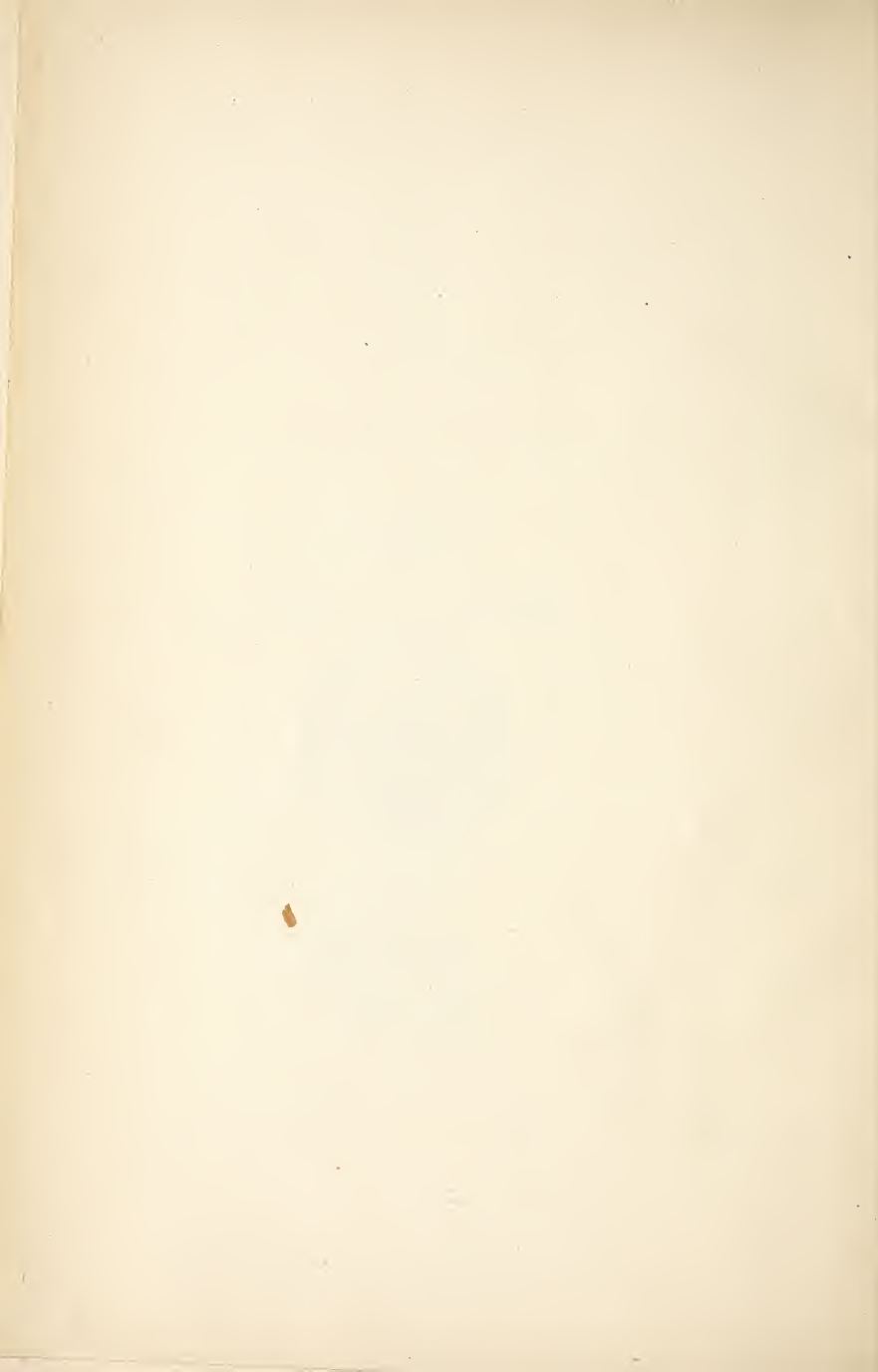


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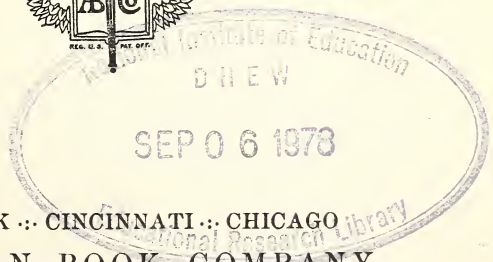


ECLECTIC EDUCATIONAL SERIES

KEY
TO
RAY'S NEW
ARITHMETICS

Joseph Ray.

INTELLECTUAL AND PRACTICAL



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SPECIAL NOTICE.

Ray's Arithmetics have recently been thoroughly revised, and issued as—

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- Ray's New Intellectual Arithmetic, . . . 25
- Ray's New Practical Arithmetic, . . . 50

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The many changes in business transactions, as well as the advance in methods of instruction, have made such revision necessary. The New Arithmetics are sold for the *same low prices* as the old editions, notwithstanding the paper, printing, binding, and general appearance are far superior. Special terms, for the exchange of the new series for the old, can be had by application to the publishers.

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PREFACE.

THIS KEY TO RAY'S NEW ARITHMETICS is presented to the public in the hope that teachers may be assisted thereby in their arduous labors.

It may be supposed that every teacher is able to solve every example in the series; but it should not therefore be required that the work shall actually be done by the teacher. The examination to which every teacher in the Public Schools submits, is the only test that can be required of the possession of knowledge. In the actual work of the school-room, the teacher is clearly entitled to use all appliances that will save him from drudgery, and enable him to devote his full time and energies to the task of imparting instruction and guiding the labors of his pupils.

In most schools, the methods of instruction have so changed that twice as much labor is now expected from the teacher as was required twenty years ago. Much work is now written on slates or paper; and this must be carefully examined, criticized, and marked. This increased labor leaves the teacher little time to work out the examples, and test their correctness.

In the Key to the Intellectual Arithmetic, all the problems which might be supposed to present the least difficulty have been briefly solved. The form of solution is usually the briefest that is consistent with accuracy and clearness ; no formal method is pursued.

The Key to the Practical Arithmetic is believed to be complete. It was not thought best to omit anything that might help any teacher. Here, too, the solutions are as brief as possible. Figures and signs are used wherever they serve the purpose. Lengthy explanations are avoided, — the work only being given.

With the hope that this Key will be found to be full and accurate, and so arranged as to prove helpful on all occasions, it is respectfully submitted to the teachers of Ray's Arithmetics.

SOLUTIONS
OF THE
MORE DIFFICULT EXAMPLES
IN
RAY'S NEW INTELLECTUAL ARITHMETIC.

LESSON I.

18. All together have the sum of 5 dollars, 3 dollars, and 1 dollar, which is 9 dollars.

25. As many as the sum of 4, 4, and 2, which is 10.

LESSON II.

25. I have the sum of 10 cents, 5 cents, 3 cents, and 3 cents, which is 21 cents.

LESSON V.

37. William's age is the sum of 8 years and 5 years, which is 13 years; and the sum of all their ages is 13 years, plus 5 years, plus 8 years, which is 26 years.
(5)

LESSON VI.

24. I received in money as many dollars as the difference between 17 dollars and 6 dollars, which is 11 dollars.

LESSON VIII.

19. I spent the sum of 20 cents and 10 cents, which is 30 cents; I had left the difference between 65 cents and 30 cents, which is 35 cents.

LESSON IX.

8. Both had the sum of 18 marbles and 18 marbles, which is 36 marbles; if when they quit one had 25 marbles, the other had the difference between 36 marbles and 25 marbles, which is 11 marbles.

14. He is worth the sum of 20 dollars and 10 dollars, which is 30 dollars. He owes the sum of 5 dollars, 6 dollars, and 10 dollars, which is 21 dollars. Should he pay his debts, he would be worth the difference between 30 dollars and 21 dollars, which is 9 dollars.

LESSON XI.

4. The sum of 19 and 10 is 29; the difference between 17 and 10 is 7; if I take 7, the difference, from 29, the sum, 22 will be left.

21. There are as many peach-trees in the orchard as the sum of 15 peach-trees, 9 peach-trees, and 10 peach-trees, which is 34 peach-trees. There are as many apple-trees as the sum of 5 apple-trees, 11 apple-trees, and 10 apple-trees, which is 26 apple-trees. Then there are as many more peach-trees than apple-trees as the difference between 34 trees and 26 trees, which is 8 trees.

LESSON XII.

22. If 1 yard of muslin cost 11 cents, 3 yards will cost 3 times 11 cents, which is 33 cents.

LESSON XIV.

11. If a man travel 7 miles in 1 hour, in 8 hours he will travel 8 times 7 miles, which is 56 miles.

17. In one hour they would be as far apart as the sum of 2 miles and 4 miles, which is 6 miles; in 3 hours they would be 3 times 6 miles apart, which is 18 miles.

LESSON XVI.

22. Each one would receive one sixth of 36 dollars, which is 6 dollars.

23. Since there are 4 quarts in 1 gallon, in 36 quarts there are as many gallons as 4 quarts are contained times in 36 quarts, which are 9.

LESSON XVIII.

24. One man will earn in 3 days one ninth of \$108, which is \$12. In one day he would earn one third of \$12, which is \$4.

25. In 1 day the former travels one third of 15 miles, which is 5 miles. In 1 day the latter travels one half of 20 miles, which is 10 miles; and if the latter travels 10 miles in 1 day, and the former, 5 miles, the latter travels as much farther in 1 day than the former as the difference between 10 miles and 5 miles, which is 5 miles.

LESSON XIX.

7. The sum of 1, 2, and 3 is 6, and 6 is contained in 60 ten times. If I have as many marbles as 3 times the number of times 6 is contained in 60, I have 3 times 10 marbles, which is 30 marbles.

8. Six hats will cost 6 times \$5, which is \$30; 4 yards of cloth will cost 4 times \$3, which is \$12. Both will cost the sum of \$30 and \$12, which is \$42; and if he gave in exchange flour at \$6 a barrel, it took as many barrels as \$6 are contained times in \$42, which are 7.

9. If a man gain 6 miles in 5 hours, it will take as many times 5 hours to gain 24 miles as 6 miles are contained times in 24 miles, which are 4; and 4 times 5 hours are 20 hours.

34. It will take 1 man 3 times 10 days, which is 30 days. It will take as many men to do it in 5 days as 5 days are contained times in 30 days, which are 6.

LESSON XXII.

2. One third of an apple is worth $\frac{1}{3}$ of three cents, which is 1 cent.

5. One fourth of a melon is worth $\frac{1}{4}$ of 8 cents, which is 2 cents; and if $\frac{1}{4}$ of a melon is worth 2 cents, $\frac{3}{4}$ of a melon are worth 3 times 2 cents, which is 6 cents.

23. One calf cost $\frac{1}{12}$ of \$120, which is \$10; and if 1 calf cost \$10, he sold the 7 calves for 7 times \$10, which is \$70.

LESSON XXIII.

9. For \$1 you can buy $\frac{1}{8}$ of a bushel, and for \$5 you can buy 5 times $\frac{1}{8}$ of a bushel, which is $\frac{5}{8}$ of a bushel.

16. One fifth of 30 is 6; then $\frac{3}{5}$ of 30 are 3 times 6, which is 18; and 18 is $\frac{18}{23}$ of 23.

LESSON XXIV.

7. One sixth of a gallon will cost $\frac{1}{5}$ of 35 cents, which is 7 cents; and if $\frac{1}{6}$ of a gallon cost 7 cents, $\frac{6}{6}$, or 1 gallon, will cost 6 times 7 cents, which is 42 cents.

17. One fourth of 8 cents is 2 cents, and $\frac{3}{4}$ are 3 times 2 cents, which is 6 cents; and if 6 cents are $\frac{2}{3}$ of nine, $\frac{1}{3}$ of nine is $\frac{1}{2}$ of 6 cents, which is 3 cents; and if 3 cents are $\frac{1}{3}$, then $\frac{3}{3}$ will be 3 times 3 cents, which is 9 cents.

LESSON XXV.

4. One yard will cost $\frac{1}{3}$ of 5 dollars, which is $1\frac{2}{3}$ dollars.

LESSON XXVI.

4. Since there are $\frac{4}{4}$ in 1, in 3 there are 3 times $\frac{4}{4}$, which is $\frac{12}{4}$; and $\frac{12}{4} + \frac{1}{4} = \frac{13}{4}$. Other answers, $\frac{19}{4}$, $\frac{21}{4}$, $\frac{27}{4}$.

LESSON XXVII.

13. To reduce a fraction to its lowest terms, divide both terms by their greatest common divisor. Of 27 and 36, the G. C. D. is 9; 9 in 27 is contained 3 times, and 9 in 36 is contained 4 times.

Therefore, $\frac{27}{36}$ changed to its lowest terms $= \frac{3}{4}$.

LESSON XXVIII.

10. Since there are $\frac{8}{8}$ in 1, in $\frac{1}{4}$ there is $\frac{1}{4}$ of $\frac{8}{8}$, which is $\frac{2}{8}$; and if $\frac{2}{8} = \frac{1}{4}$, then $\frac{3}{4}$ will be 3 times $\frac{2}{8}$, which is $\frac{6}{8}$.

LESSON XXIX.

4. The common denominator is 15. $1 = \frac{15}{15}$; $\frac{1}{3} = \frac{5}{15}$, and $\frac{2}{3} = \frac{10}{15}$; $\frac{1}{5} = \frac{3}{15}$, and $\frac{2}{5} = \frac{6}{15}$.

LESSON XXX.

2. Three fourths $= \frac{6}{8}$, and $\frac{1}{2} = \frac{4}{8}$. He gave for both $\frac{6}{8} + \frac{4}{8} = \frac{10}{8} = \$1\frac{1}{4}$.

LESSON XXXI.

3. One half of the first $= \frac{3}{6}$ of a melon; $\frac{2}{3}$ of the second $= \frac{4}{6}$ of a melon. $\frac{4}{6} - \frac{3}{6} = \frac{1}{6}$.

LESSON XXXII.

14. Find how much is in both air and water: as much as the sum of $\frac{1}{2}$ and $\frac{1}{3}$. $\frac{1}{2} = \frac{3}{6}$, and $\frac{1}{3} = \frac{2}{6}$; their sum is $\frac{5}{6}$. Since there are $\frac{6}{6}$ in the pole, there would be as much in the earth as the difference between $\frac{6}{6}$ and $\frac{5}{6}$, which is $\frac{1}{6}$.

LESSON XXXIII.

2. To 5 horses he would give 5 times $\frac{1}{2}$ peck, which is $\frac{5}{2}$ pecks; and $\frac{5}{2}$ pecks $= 2\frac{1}{2}$ pecks.

LESSON XXXIV.

8. One pound of cheese will sell for $\frac{1}{4}$ of 30 cents, which is $7\frac{1}{2}$ cents. Then 3 pounds will sell for 3 times $7\frac{1}{2}$ cents, which is $22\frac{1}{2}$ cents.

28. One seventh of 18 is $2\frac{4}{7}$; then $\frac{2}{7} = 2$ times $2\frac{4}{7}$ feet, which is $5\frac{1}{7}$ feet; and $\frac{5}{7} = 5$ times $2\frac{4}{7}$ feet, which is $12\frac{6}{7}$ feet.

29. One ninth of \$15 is $\$1\frac{2}{3}$; then $\frac{2}{9} = 2$ times $\$1\frac{2}{3}$, which is $\$3\frac{1}{3}$; $\frac{1}{3}$ of \$15 is \$5; $\$5 + \$3\frac{1}{3} = \$8\frac{1}{3}$, $\$15 - \$8\frac{1}{3} = \$6\frac{2}{3}$.

31. $\frac{5}{5} - \frac{2}{5} = \frac{3}{5}$. $\$18 = \frac{3}{5}$ of the number, then $\frac{1}{5}$ would be $\frac{1}{3}$ of \$18, which is \$6; and $\frac{2}{5}$ would be 2 times \$6, which is \$12.

32. $\$45 = \frac{7}{7} + \frac{2}{7}$, which is $\frac{9}{7}$ of the cost. $\frac{1}{7}$ is $\frac{1}{9}$ of \$45 $= \$5$; and $\frac{7}{7}$ would be 7 times \$5 $= \$35$.

LESSON XXXVI.

22. Five and three sevenths pounds of sugar cost $5\frac{3}{7}$ times 7 cents, which is 38 cents. It would take as many pounds of raisins to pay for it as 6 cents are contained times in 38 cents, which are $6\frac{1}{3}$.

LESSON XXXVIII.

9. One pound will cost $\frac{1}{4}$ of $\$ \frac{5}{4} = \$ \frac{5}{16}$; then 7 pounds will cost 7 times $\$ \frac{5}{16} = \$ \frac{35}{16} = \$ 2\frac{3}{16}$.

LESSON XXXIX.

16. The sum of $\frac{1}{5}$ and $\frac{2}{5} = \frac{3}{5}$; $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$; then 14 ft. $= \frac{2}{5}$ of the pole; $\frac{1}{5} = 7$ ft.; $\frac{5}{5} = 35$ ft.

23. $\$12 = \frac{4}{3}$ of the cost; $\frac{1}{3}$ of the cost is $\frac{1}{4}$ of $\$12 = \3 ; $\frac{3}{3} = \$9$. One yard cost $\frac{1}{5}$ of $\$9 = \$1\frac{4}{5}$.

28. One eighth of the cost was $\frac{1}{5}$ of $\$50$, which is $\$10$; then $\frac{8}{8}$ are 8 times $\$10$, which is $\$80$. It would take as many yards as $\$4$ are contained times in $\$80$, which are 20.

LESSON XL.

11. One third of the number is $\frac{1}{3}$ of 56, which is 7; then $\frac{3}{3}$ are 3 times 7, which is 21; 21 is 3 times 7.

LESSON XLI.

9. One fourth of a bu. of wheat is worth $\frac{1}{3}$ of a bu. of rye; then $\frac{4}{4}$ of a bu. of wheat are worth $\frac{4}{3}$ of a bu. of rye; and $\frac{1}{5}$ of a bu. of wheat is worth $\frac{1}{5}$ of $\frac{4}{3}$ of a bu. of rye, which is $\frac{4}{15}$ of a bu. of rye; and $\frac{4}{5}$ of a bu. of wheat are worth 4 times $\frac{4}{15}$ of a bu. of rye, which is $\frac{16}{15}$, or $1\frac{1}{15}$ bu. of rye.

LESSON XLIII

22. As many bu. of rye as $\frac{3}{4}$ are contained times in $4\frac{1}{2}$.
 $4\frac{1}{2} = \frac{18}{4}$; $\frac{18}{4} \div \frac{3}{4} = 6$.

LESSON XLIV.

11. $\$3\frac{1}{10} = \$3\frac{31}{10}$; $7\frac{3}{4} = \frac{31}{4}$; $\frac{1}{4}$ of a doz. cost $\frac{1}{31}$ of $\$3\frac{31}{10}$, which is $\$1\frac{1}{10}$; then 1 pair cost $\frac{1}{3}$ of $\$1\frac{1}{10}$, or $\$3\frac{1}{30}$. He gained the difference between $\$1\frac{1}{10}$ and $\$3\frac{1}{30}$, which is $\$1\frac{1}{15}$.

12. $2\frac{1}{2} = \frac{5}{2}$. $\frac{1}{2}$ doz. cost $\frac{1}{5}$ of \$15, which is \$3; then each one cost $\frac{1}{6}$ of \$3, which is $\$1\frac{1}{2}$. He gained on each one the difference between $\$3\frac{1}{2}$ and $\$1\frac{1}{2}$, which is $\$1\frac{1}{10}$.

On $\frac{1}{2}$ doz. he gained $\$1\frac{6}{10}$; and on $\frac{5}{2}$ doz. $\$3\frac{30}{10}$, or \$3.

LESSON XLV.

22. A walks 5 miles 7 times in walking 35 miles; B walks 3 miles 7 times in the same time. Therefore, B walks 7 times 3 miles, which is 21 miles.

25. One horse will eat $\frac{1}{6}$ of 12 bu. in a week, which is 2 bu. a week; then 10 horses will eat 10 times 2 bu. in a week, which is 20 bushels.

26. Five horses will eat in 1 week $\frac{1}{2}$ of 16 bu., which is 8 bu; to eat 56 bu., it will take them as many weeks as 8 is contained times in 56, which are 7.

28. It will take 6 times 12 horses, which is 72 horses, to eat it in 1 day; and to eat it in 9 days it will take $\frac{1}{9}$ of 72 horses, which is 8 horses.

LESSON XLVI.

6. Nine times 9 = 81. $81 \div 12 = 6\frac{9}{12}$, or $6\frac{3}{4}$.

8. $\frac{48}{120} = \frac{2}{5}$. $\frac{54}{189} = \frac{2}{7}$. $\frac{240}{88} = \frac{5}{6}$.

9. One ninth = $\frac{16}{144}$, $\frac{3}{9} = \frac{48}{144}$; $\frac{1}{16} = \frac{9}{144}$, $\frac{4}{16} = \frac{36}{144}$;
 $\frac{1}{72} = \frac{2}{144}$, $\frac{17}{72} = \frac{34}{144}$.

12. If he traveled $\frac{1}{4}$, or $\frac{3}{12}$, the first day, and $\frac{1}{3}$, or $\frac{4}{12}$, the second day, then the third day he must have traveled $\frac{1}{2}$ less $\frac{7}{12}$, which is $\frac{5}{12}$; $\frac{5}{12}$ of 84 miles = 35 miles.

21. $\$99 = \frac{8}{8} + \frac{3}{8}$, or $\frac{11}{8}$, of the cost; then $\frac{1}{8} = \$9$, and $\frac{8}{8}$, the cost, = \$72.

22. One eighth of \$96 = \$12, or $\frac{1}{8}$ of the cost; then the cost was 5 times \$12 = \$60. It took as many barrels of flour to pay for the horse as \$6 are contained times in \$60, which are 10.

23. Eighty-four is $\frac{7}{6}$ of 72, and 72 is 8 times 9.

25. Eight ninths of 81 = 72, and $72 = \frac{8}{9}$ of 64.

26. Four sevenths of 35 are 20, and 20 is $\frac{5}{6}$ of 24. Three eighths of 16 are 6, and 24 is 4 times 6.

27. $\$17\frac{1}{2} = \$3\frac{5}{2}$. $4\frac{3}{8}$ yd. $= \frac{35}{8}$ yd. $\frac{1}{8}$ of a yd. would cost $\frac{1}{35}$ of $\$3\frac{5}{2}$, which is $\$1\frac{1}{2}$; then $\frac{8}{8}$ of a yd. would cost $\$8$, or $\$4$.

33. In one week he would earn $\frac{1}{8}$ of $\$72$, which is $\$9$; in one day he would earn $\frac{1}{6}$ of $\$9$, which is $\$1\frac{1}{2}$.

37. One half of 20 years $= 10$ years, or $\frac{1}{5}$ of the father's age; then 5 times 10 years $= 50$ years, the father's age. $\frac{1}{10}$ of 50 years $= 5$ years, or the age of the youngest son.

38. $\$21 = \frac{7}{5}$ of the cost. $\frac{1}{5} = \frac{1}{7}$ of $\$21$, which is $\$3$. $\frac{5}{5} = \$15$, or the cost. At $\$1$ a bushel, it would take 15 bushels of corn to pay for it; at $\$1\frac{1}{3}$, it would take 3 times 15 bushels, which is 45 bushels.

39. Three yards $= \frac{15}{5}$ yards. $\frac{15}{5}$ are 5 times $\frac{3}{5}$, and will cost 5 times $\$2\frac{2}{3}$, which is $\$3\frac{1}{3}$.

41. One half of 12 $= 6$. $6 + 2 = 8$. 8 is $\frac{1}{3}$ of 24.

44. Three fourths of 24 $= 18$. $18 - 6 = 12$. 12 is $\frac{2}{3}$ of 18. 18 is 6 more than $\frac{2}{3}$ of itself.

50. Two fifths of 30 yards $= 12$ yards. He sold one yard for $\frac{1}{12}$ of $\$48$, which is $\$4$.

60. Three fifths of $\$20$ are $\$12$. Fourteen is $\frac{7}{9}$ of 18, and 2 times 18 are 36. Twelve is $\frac{1}{3}$ of 36.

79. Two fifths of 10 yards are 4 yards, and they cost $\frac{2}{5}$ of $\$90$, which is $\$36$. $\$40 - \$36 = \$4$, the gain on 4 yards, and on 1 yard the gain is $\$1$.

80. B gains in one day 23 miles less 18 miles, which are 5 miles. It will take as many days to gain 40 miles as 5 miles are contained times in 40 miles, which are 8.

81. The hound gains in one second 10 feet less 7 feet = 3 ft., or 1 yd.; then to gain 90 yards it will take 90 seconds, or $1\frac{1}{2}$ min. The hound runs 90 times 10 feet, which are 900 ft. = 300 yd. The hare runs 90 times 7 ft. = 630 feet, or 210 yd.

85. In one hour the cistern would lose 9 gallons less 6 gallons, which are 3 gallons; and it would take as many hours to empty the cistern as 3 gallons are contained times in 36 gallons, which are 12.

89. Such part of the journey as $2\frac{1}{4}$ days are of $3\frac{3}{8}$ days. $3\frac{3}{8} = \frac{27}{8}$. $2\frac{1}{4} = \frac{18}{8}$. $\frac{18}{8} = \frac{18}{8}$, or $\frac{2}{3}$, of $\frac{27}{8}$. He can therefore perform $\frac{2}{3}$ of the journey in $2\frac{1}{4}$ days.

90. In one day A can do $\frac{1}{2}$, B $\frac{1}{4}$, and C $\frac{1}{6}$; then all do the sum of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{6}$, which is $\frac{11}{12}$, in one day. To do $\frac{11}{12}$, it will take as many days as $\frac{11}{12}$ are contained times in $\frac{12}{12}$, which are $1\frac{1}{11}$.

91. Twenty yards at \$4 per yard = \$80. 15 yards at \$3 per yard = \$45. $\$80 + \$45 = \$125$, or what I paid for 35 yards. I received for $\frac{6}{7}$, or 30 yards, \$3 per yard = \$90, and for $\frac{1}{7}$, or 5 yards, \$4 per yard = \$20. For all I received $\$90 + \$20 = \$110$. My loss on 35 yards was $\$125 - \$110 = \$15$, or $\$ \frac{15}{35} = \$ \frac{3}{7}$ per yard.

93. Three fourths of 6 miles are $4\frac{1}{2}$ miles. 6 miles less $4\frac{1}{2}$ miles = $1\frac{1}{2}$ miles, the distance B gains in one hour. To gain 36 miles, it will take as many hours as $1\frac{1}{2}$ miles are contained times in 36 miles, which are 24.

LESSON LIII.

1. Five bu. will cost 5 times 60 cents, which is \$3; 3 pk. will cost $\frac{3}{4}$ of 60 cents, which is 45 cents; then 5 bu. and 3 pk. will cost \$3.45.

2. Four gal. 2 qt. 1 pt. = 37 pt.; at 5 cents a pint, the milk will cost 37 times 5 cents, which is \$1.85.

4. One rod contains 198 in.; 2 yd. 2 ft. 3 in. = 99 in., or $\frac{1}{2}$ a rod; then $5\frac{1}{2}$ rods will cost $5\frac{1}{2}$ times \$12, which is \$66.

5. Twenty-six min. and 40 sec. = $\frac{4}{9}$ of an hour; 9 hours + $\frac{4}{9}$ hours = $9\frac{4}{9}$ hours. If it traveled 9 miles an hour, the distance is $9\frac{4}{9}$ times 9 miles = 85 miles.

8. Three tenths da. = $\frac{3}{10}$ of 24 hr., which is $7\frac{1}{5}$ hr.; $7\frac{1}{5}$ hr. + $\frac{2}{5}$ hr. = $7\frac{3}{5}$ hours.

9. One third rd. = $5\frac{1}{2}$ ft., or $5\frac{1}{4}$ ft.; $\frac{1}{2}$ yd. = $1\frac{1}{2}$ ft., or $1\frac{3}{4}$; then $5\frac{1}{4}$ ft. + $1\frac{3}{4}$ ft. = $7\frac{3}{4}$ ft.

11. One bu. 3 pk. = 7 pk; 1 pk. is worth $\frac{1}{7}$ of 70 cents, which is 10 cents; 2 bu. 1 pk. = 9 pk.; and 4 qt. = $\frac{1}{2}$ pk.; then $9\frac{1}{2}$ pk. are worth $9\frac{1}{2}$ times 10 cents, which is 95 cents.

13. One third of a T. cost $\frac{1}{2}$ of \$8, which is \$4; 1 T. cost \$12; 1 cwt. cost $\frac{1}{20}$ of \$12, which is 60 ct.; 3 cwt. 75 lb. = $3\frac{3}{4}$ cwt.; then $3\frac{3}{4}$ cwt. cost $3\frac{3}{4}$ times 60 ct., which is \$2.25.

14. In 2 hr. 24 min. there are 144 min.; the rate per min. is $\frac{1}{144}$ of 60 miles = $\frac{60}{144}$ mi., or $\frac{5}{12}$ mi.; the rate per hr. is 60 times $\frac{5}{12}$ mi., which is $\frac{300}{12}$ mi. = 25 mi.

Key 2.

15. In 3 yd. 1 ft. 6 in. there are $3\frac{1}{2}$ yd.; in 1 rd. 5 yd. there are $10\frac{1}{2}$ yd.; the wheel would make as many revolutions in going $10\frac{1}{2}$ yd. as $3\frac{1}{2}$ yd. are contained times in $10\frac{1}{2}$ yd., which are 3.

17. I bought as many pounds as 40 ct. are contained times in 235 ct., which are $5\frac{7}{8}$; $\frac{7}{8}$ lb. = 14 oz. I bought 5 lb. 14 oz.

20. In 150 bu. are 6 T.; 6 T. will cost 6 times \$3.75, which is \$22.50; 1 bu. will cost $\frac{1}{25}$ of \$3.75, which is 15 ct.

21. The distance around the lot is 50 ft. + 100 ft. \times 2 = 300 ft.; 300 ft. = 100 yd.; 100 yd. = $18\frac{2}{11}$ rd. If 1 rd. cost \$5, then $18\frac{2}{11}$ rd. cost $18\frac{2}{11}$ times \$5, which is $\$90\frac{10}{11}$.

LESSON LIV.

15. The entire cost was \$90 plus $\$3 \times 6 = \108 ; the sum received for him was $\$42 + \$99 = \$141$; all gained $\$141 - \$108 = \$33$; each man received $\frac{1}{3}$ of \$33, which is \$11.

LESSON LV.

12. In 6 da. of 8 hr. each there are 48 hr.; in 7 da. of 9 hr. each there are 63 hr.; $\$9\frac{3}{5} = \$\frac{48}{5}$. In 1 hr. he would earn $\frac{1}{48}$ of $\$4\frac{8}{5}$, which is $\$1\frac{1}{5}$; in 63 hr., $\$6\frac{3}{5} = \$12\frac{3}{5}$.

15. In $3\frac{1}{2}$ are $\frac{7}{2}$; $2\frac{1}{3} = \frac{7}{3}$. $\frac{1}{3}$ of the number is $\frac{1}{7}$ of $\frac{7}{2} = \frac{1}{2}$; then $\frac{3}{3} = \frac{3}{2}$, or $1\frac{1}{2}$. $1\frac{1}{2} \times 2\frac{1}{2} = \frac{3}{2} \times \frac{5}{2} = \frac{15}{4} = 3\frac{3}{4}$.

18. Two thirds of $\frac{6}{5} = \frac{4}{5}$. If $\frac{4}{5}$ are $\frac{2}{7}$, then $\frac{1}{7}$ is $\frac{1}{2}$ of $\frac{4}{5}$, which is $\frac{2}{5}$; and $\frac{7}{7}$ would be 7 times $\frac{2}{5}$, which is $\frac{14}{5} = 2\frac{4}{5}$.

22. Two thirds of $\frac{12}{5}$ are $\frac{8}{5}$. If $\frac{8}{5}$ are $\frac{1}{2}$, then $\frac{2}{5}$ are $\frac{16}{5}$; and 2 is contained in $\frac{16}{5}$, $\frac{8}{5}$ or $1\frac{3}{5}$ times.

25. Four fifths of 10 marbles are 8 marbles. If 8 is $\frac{8}{11}$, then $\frac{1}{11}$ is 1, and $\frac{11}{11}$ are 11.

26. Three fifths of 60 plums are 36 plums; $\frac{3}{4}$ of 36 are 27; $\frac{4}{9}$ of 27 are 12, or what she gave away. She had left $36 - 12 = 24$.

27. Five sevenths of the distance is 35 mi.; then $\frac{1}{7}$ is 7 mi., and $\frac{2}{7}$ are 14 mi.; $\frac{3}{7}$ of 14 mi. = 6 mi.; 14 mi. — 6 mi. = 8 mi.

30. Seven sevenths less $\frac{2}{7} = \frac{5}{7}$; $\frac{2}{5}$ of $\frac{5}{7} = \frac{2}{7}$; $\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$, the part she had left. $\frac{3}{7} = 6$, $\frac{1}{7} = 2$, $\frac{7}{7} = 14$.

31. Two thirds of 12 ct. are 8 ct. If 8 is $\frac{1}{2}$, then $\frac{2}{2}$ are 16; if 16 ct. are $\frac{4}{5}$ of William's money, then William has 20 ct.

32. If $\frac{1}{2}$ of B's money equals $\frac{2}{7}$ of A's, then all of B's money = $\frac{4}{7}$ of A's; $\frac{7}{7} - \frac{4}{7} = \frac{3}{7}$, the difference between A's and B's money; $\frac{3}{7} = 12$ ct., $\frac{1}{7} = 4$ ct., $\frac{7}{7} = 28$ ct., A's money; 28 ct. — 12 ct. = 16 ct., B's.

33. One third = $\frac{4}{12}$, $\frac{1}{4} = \frac{3}{12}$; $\frac{4}{12} + \frac{3}{12} + \frac{1}{12} = \frac{8}{12} = \frac{2}{3}$; then $32 = \frac{1}{3}$; $\frac{3}{3} = 96$, the number of trees in the orchard. $\frac{1}{3}$ of 96 = 32; $\frac{1}{4}$ of 96 = 24; $\frac{1}{12}$ of 96 = 8.

34. If $\frac{2}{9}$ are pear-trees, $\frac{7}{9}$ must be apple-trees. The excess of apple-trees is therefore $\frac{5}{9}$ of the whole; 25 is then $\frac{5}{9}$ of the whole; $\frac{2}{9}$, or the pear-trees, = 10, and $\frac{7}{9}$, or the apple-trees, = 35.

LESSON LVI.

3. If the second is three times the first, then the whole number is four times the first. Therefore, the first is $\frac{1}{4}$ of $16 = 4$, and the second $4 \times 3 = 12$.

5. The whole number will be six times the first part; then the first part $= \frac{1}{6}$, the second $\frac{2}{6}$, the third $\frac{3}{6}$, or 4, 8, and 12, respectively.

10. The difference of the two numbers is $6 + 2 = 8$; the sum of 8, the difference, and 4, one of the numbers, $= 12$, the other number.

11. The sum of 19 and 6 is 25; $25 - 10 = 15$, the difference between the numbers; then $19 - 15 = 4$, the smaller number.

12. The sum of the numbers is $10 + 8 = 18$; $18 - 5 = 13$, the other number.

18. They had at first $32 \text{ ct.} - 8 \text{ ct.} = 24 \text{ ct.}$; each had $\frac{1}{2}$ of $24 \text{ ct.} = 12 \text{ ct.}$ If Thomas found 8 more, he had $12 \text{ ct.} + 8 \text{ ct.} = 20 \text{ ct.}$

19. They bought $4 \text{ peaches} + 6 \text{ peaches} + 20 \text{ peaches} = 30 \text{ peaches}$; each one bought $\frac{1}{2}$ of 30 peaches, which is 15 peaches. Thomas had left $15 - 4 = 11$; William had left $15 - 6 = 9$.

20. Both bought $24 \text{ cherries} + 7 \text{ cherries} + 5 \text{ cherries} = 36 \text{ cherries}$. Since Mary bought twice as many as Sarah, both bought three times as many as Sarah; there-

fore Sarah bought $\frac{1}{3}$ of 36 cherries = 12 cherries, and Mary bought 2 times 12 cherries = 24 cherries; $24 - 7 = 17$, the number of cherries Mary had left; $12 - 5 = 7$, the number Sarah had left.

21. Three times the number is $50 - 5 = 45$; $\frac{1}{3}$ of 45 is 15, the number.

22. Three fourths of the number would be $31 - 10 = 21$; $\frac{1}{4}$ would be $\frac{1}{3}$ of $21 = 7$; $\frac{4}{4}$, or the number, would be 28.

23. Four fifths of the number would be $21 + 7 = 28$; then $\frac{1}{5}$ is $\frac{1}{4}$ of $28 = 7$, and $\frac{5}{5} = 35$.

25. Since Sarah has 3 cents less than Mary, she has only 5 cents more than Jane. Three times Jane's money is 43 ct. — 8 ct. — 5 ct. = 30 ct.; then Jane's money is $\frac{1}{3}$ of 30 ct. = 10 ct.; Mary's is 10 ct. + 8 ct. = 18 ct.; Sarah's is 10 ct. + 5 ct. = 15 ct.

26. Three times Frank's age = 42 yr. + 3 yr., which is 45 yr.; then Frank's age is $\frac{1}{3}$ of 45 yr. = 15 yr. Mary's age is 2 times 15 yr. less 3 yr. = 27 yr.

27. The ring cost \$5 and the watch \$12 more than the chain; then $\$62 - \$12 - \$5 = \45 , which is 3 times the cost of the chain; $\frac{1}{3}$ of $\$45 = \15 , the cost of the chain; $\$15 + \$5 = \$20$, cost of the ring; and $\$15 + \$12 = \$27$, cost of the watch.

28. One half of $\frac{4}{7}$ is $\frac{2}{7}$. If $30 + 6$, or 36, is $\frac{2}{7}$, then $\frac{1}{7}$ is 18, and $\frac{7}{7}$ are 7 times 18 = 126.

29. James has one part; John has two parts + \$3; Frank has three parts + \$3 + \$7; $\$55 - \$3 - \$3 - \$7 = \$42$, which is 6 times James's money. $\frac{1}{6}$ of \$42 is \$7, James's money; 2 times \$7, + \$3 = \$17, John's money; and 3 times \$7, + \$3, + \$7 = \$31, Frank's.

30. Thomas has 1 part; Joseph has 3 parts less \$2; Paul has 8 parts less \$4 less \$20; then $\$20 + \$4 + \$2 + \22 equal \$48, which is 12 times Thomas's money. $\frac{1}{12}$ of \$48 is \$4, Thomas's money; 3 times \$4, — \$2 = \$10; Joseph's money; 8 times \$4, — \$24 = \$8, Paul's money.

31. The harness cost 1 part; the horse, 1 part + \$50; the buggy, 2 parts + \$50 + \$25; then $\$225 - \$50 - \$50 - \$25 = \$100$, which is 4 times the cost of the harness. $\frac{1}{4}$ of \$100 is \$25, cost of harness; $\$25 + \$50 = \$75$, cost of horse; 2 times \$25 + \$75 = \$125, cost of buggy.

LESSON LVII.

2. Both have to pay $\frac{3}{7} + \frac{7}{7} = \frac{10}{7}$; $\frac{1}{7}$ is $\frac{1}{10}$ of \$60 = \$6. John pays 3 times \$6 = \$18; Thomas pays 7 times \$6 = \$42.

3. Four fourths + $\frac{3}{4} = \frac{7}{4}$; $\frac{1}{4}$ is $\frac{1}{7}$ of 56 mi. = 8 mi.; $\frac{4}{4}$ are 32 mi., and $\frac{3}{4}$ are 24 mi., the distance traveled each day, respectively.

4. Since the first, plus $\frac{5}{7}$ of the first, less 8 (that is $\frac{12}{7}$ of the first less 8), = 100, then $\frac{12}{7}$ of the first = 108; $\frac{1}{7}$ is $\frac{1}{12}$ of 108 = 9; $\frac{7}{7} = 63$, the first; $\frac{5}{7} = 45$, and 45 less 8 = 37, the second.

5. Four fourths $+ \frac{2}{4} + \frac{3}{4} = \frac{9}{4}$, or 45; $\frac{1}{4}$ is $\frac{1}{9}$ of $45 = 5$. $\frac{4}{4} = 20$, the first part; $\frac{2}{4} = 10$, the second part; $\frac{3}{4} = 15$, the third part.

10. If $\frac{1}{2}$ of the cows $= \frac{2}{7}$ of the sheep, then all of the cows $= \frac{4}{7}$ of the sheep, and $1 + \frac{4}{7} = \frac{11}{7}$ of the sheep; $\frac{1}{7}$ of the sheep is $\frac{1}{11}$ of $55 = 5$; $\frac{7}{7} = 35$, the number of sheep; $\frac{4}{7} = 20$, the number of cows.

11. If $\frac{1}{3}$ of the less $= \frac{2}{9}$ of the greater, $\frac{3}{3}$, or the whole of the less, $= 3$ times $\frac{2}{9}$, which is $\frac{6}{9} = \frac{2}{3}$; then $\frac{3}{3} + \frac{2}{3} = 60$; $\frac{1}{3}$ is $\frac{1}{5}$ of $60 = 12$; $\frac{3}{3} = 36$, the greater number; $\frac{2}{3} = 24$, the smaller number.

12. If $\frac{1}{4}$ of Mary's age $= \frac{1}{3}$ of Sarah's, $\frac{4}{4}$ of Mary's age $= \frac{4}{3}$ of Sarah's; $\frac{4}{4} + \frac{3}{3} = \frac{7}{3}$; $\frac{1}{3}$ of Sarah's age is $\frac{1}{7}$ of $14 = 2$; $\frac{3}{3} = 6$, Sarah's age; $\frac{4}{3} = 8$, Mary's age.

13. If $\frac{2}{3}$ of the first $= \frac{3}{4}$ of the second, $\frac{1}{3}$ is $\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$, and $\frac{3}{3}$, or the whole of the first, $= \frac{9}{8}$ of the second. If the first is $\frac{9}{8}$ of the second, and the second $\frac{8}{8}$, both $= \frac{17}{8}$ of the second. $\frac{1}{8}$ is $\frac{1}{17}$ of $51 = 3$; $\frac{9}{8} = 27$, the first part; $\frac{8}{8} = 24$, the second.

14. If $\frac{2}{3}$ of the apple-trees $= \frac{4}{7}$ of the peach-trees, $\frac{1}{3} = \frac{2}{7}$, and $\frac{3}{3} = \frac{6}{7}$; $\frac{3}{3} = \frac{7}{7}$; then $\frac{7}{7}$ of the peach-trees $+ \frac{6}{7}$ of the peach-trees $= \frac{13}{7}$ of the peach-trees, and $\frac{1}{7}$ is $\frac{1}{13}$ of 65 trees $= 5$ trees. $\frac{7}{7} = 35$, the number of peach-trees; $\frac{6}{7} = 30$, the number of apple-trees.

15. If $\frac{2}{3}$ of A's distance $= \frac{5}{6}$ of B's, then $\frac{1}{3} = \frac{5}{18}$, and $\frac{3}{3} = \frac{15}{18}$, or $\frac{5}{6}$; then A travels $\frac{5}{6}$ as far as B, and both traveled $\frac{5}{6} + \frac{6}{6} = \frac{11}{6}$, or 66 miles. $\frac{1}{6}$ is $\frac{1}{11}$ of 66 mi. $= 6$ mi.; $\frac{6}{6} = 36$ mi., B's distance; $\frac{5}{6} = 30$ mi., A's distance; and 36 mi. $- 30$ mi. $= 6$ mi., the number of miles B traveled more than A.

16. Let $\frac{1}{12} =$ the apple-trees; $\frac{4}{12} =$ the plum-trees; $\frac{1}{2}$ of $\frac{1}{12} + \frac{1}{4}$ of $\frac{4}{12} = \frac{7}{12}$, the cherry-trees; then $\frac{1}{12} + \frac{4}{12} + \frac{7}{12} = \frac{23}{12}$, or 69 trees. $\frac{1}{12}$ is $\frac{1}{23}$ of $69 = 3$; $\frac{4}{12} = 36$, the number of apple-trees; $\frac{4}{12} = 12$, the plum-trees; and $\frac{7}{12} = 21$, the cherry-trees.

17. Five thirds of 12 yr. are 20 yr. If 20 yr. are $\frac{4}{9}$ of both Jane's and Sarah's age, $\frac{1}{9}$ is 5 yr., and $\frac{8}{9}$ are 45 yr. If Jane's age is $\frac{7}{8}$ of Sarah's, then $\frac{8}{8} + \frac{7}{8} = \frac{15}{8}$, and $\frac{15}{8} = 45$ yr.; $\frac{1}{8} = 3$ yr., and $\frac{8}{8} = 24$ yr., Sarah's age; $\frac{7}{8} = 21$ yr., Jane's age.

18. Three elevenths of 44 are 12; $\frac{4}{5}$ of 30 is 24; 24 is $\frac{4}{9}$ of 54; twice 54 are 108; 12 is contained in 108 nine times.

19. John's money is $\frac{3}{5}$, and Charles's $\frac{5}{5}$, or $\frac{20}{20}$; $\frac{3}{4}$ of $\frac{3}{5} = \frac{9}{20}$, and $\frac{9}{20} + \$33 = \frac{20}{20}$, Charles's money; then $\frac{11}{20} = \$33$. $\frac{1}{20} = \$3$, and $\frac{20}{20} = \$60$, Charles's money; $\frac{3}{5}$ of $\$60 = \36 , John's money.

20. Let $\frac{1}{12} =$ the hogs; then $\frac{8}{12} =$ the sheep, and $\frac{6}{12}$ the cows; $\frac{1}{12} + \frac{8}{12} + \frac{6}{12} = \frac{26}{12}$, and $\frac{26}{12} = 104$; $\frac{1}{12} = 4$. $\frac{1}{12} = 48$, the hogs; $\frac{8}{12} = 32$, the sheep; and $\frac{6}{12} = 24$, the cows.

22. From noon to midnight is 12 hr. If the time elapsed since noon is $\frac{2}{5}$ of the time to midnight, then it is still $\frac{5}{5}$ to midnight; $\frac{3}{5} + \frac{5}{5} = \frac{8}{5}$, and $\frac{8}{5} = 12$ hr; $\frac{1}{5}$ is $\frac{1}{5}$ of 12 hr. $= 1\frac{1}{2}$ hr.; $\frac{3}{5} = 4\frac{1}{2}$ hr. Therefore it is half-past four o'clock, P. M.

23. Since once the time past noon $+ 3$ hr. is $\frac{1}{2}$ the time to midnight, twice the time past noon $+ 6$ hr. $=$ the whole time to midnight; but the time past noon $+$

the time to midnight is 12 hr.; hence the time past noon, with twice the time past noon $+ 6$ hr. $= 12$ hr.; hence 3 times the time past noon is 6 hr., and the time past noon is $\frac{1}{3}$ of 6 hr. $= 2$ hr.

24. Let $\frac{5}{3} =$ the whole time; the time past noon is $\frac{1}{3}$; from midnight to noon is $\frac{4}{3}$; then $\frac{4}{3} = 12$ hr; $\frac{1}{3} = 3$ hr. It is 3 o'clock in the afternoon.

25. Let $\frac{4}{3} =$ the whole time; from midnight to noon is $\frac{3}{4}$; the time past noon $= \frac{1}{4}$; $\frac{3}{4} = 12$ hr.; $\frac{1}{4} = 4$ hr. It is 4 o'clock in the afternoon.

26. If $\frac{1}{2}$ the time past noon $= \frac{1}{20}$ of the time past midnight, the whole time past noon $= \frac{1}{10}$ the time past midnight; $\frac{10}{10} =$ the whole time; $\frac{1}{10} =$ the time past noon; $\frac{9}{10} =$ the time from midnight to noon, or 12 hr.; $\frac{1}{10} = 1\frac{1}{3}$ hr. It is 20 min. past one o'clock P. M.

LESSON LVIII.

2. One $+ \frac{2}{3} = \frac{5}{3}$; $\frac{1}{3}$ is $\frac{1}{5}$ of $20 = 4$; $\frac{3}{5} = 12$, the number.

4. Twice the number is $\frac{10}{5}$, and $\frac{10}{5} + \frac{3}{5} = \frac{13}{5}$. If $\frac{13}{5} = 52$, then $\frac{1}{5}$ is $\frac{1}{13}$ of $52 = 4$, and $\frac{5}{5} = 20$, the number.

5. Twice the number is $\frac{14}{7}$, and $\frac{14}{7}$ less $\frac{4}{7} = \frac{10}{7}$. If $\frac{10}{7} = 40$, then $\frac{1}{7}$ is $\frac{1}{10}$ of 40, which is 4, and $\frac{7}{7} = 28$.

6. Let $\frac{5}{3} =$ the number; 3 times $\frac{5}{3}$ less $\frac{3}{5} = \frac{12}{5}$. If $\frac{12}{5} = 48$, then $\frac{1}{5}$ is $\frac{1}{12}$ of $48 = 4$, and $\frac{5}{5} = 20$.

7. Let $\frac{6}{6} =$ his age; then $\frac{6}{6} + \frac{3}{6} + \frac{4}{6} = \frac{13}{6}$. If $26 = \frac{13}{6}$, then $\frac{1}{6} = 2$, and $\frac{6}{6} = 12$.

8. Her age $= \frac{1}{12}$, and $\frac{1}{12} + \frac{4}{12} + \frac{3}{12} = \frac{19}{12}$; twice her age is $\frac{24}{12}$, and $\frac{24}{12} - \frac{19}{12} = \frac{5}{12}$; ten years $= \frac{5}{12}$, and $\frac{1}{12} = 2$ years; then $\frac{1}{12}$, her age, is 24 years.

9. Five fifths less $\frac{2}{5} = \frac{3}{5}$; $\frac{3}{5}$ are 30 cents, then $\frac{5}{5}$ are 50 cents.

10. Let $\frac{1}{10} =$ the number; $\frac{1}{10} + \frac{5}{10} + \frac{6}{10} = \frac{21}{10}$; three times the number is $\frac{30}{10}$; $\frac{30}{10} - \frac{21}{10} = \frac{9}{10}$; $27 = \frac{9}{10}$; $\frac{1}{10} = 3$; $\frac{1}{10} = 30$.

11. Let $\frac{1}{11} =$ the father's age; $\frac{1}{11} - \frac{3}{11} = \frac{8}{11}$; $\frac{8}{11} = 40$ yr.; $\frac{1}{11} = 5$ yr.; $\frac{1}{11} = 55$ yr.

12. Let $\frac{5}{9} =$ her age; $\frac{5}{9} + \frac{4}{9} = \frac{9}{9}$; three times her age is $\frac{15}{9}$; $\frac{15}{9} - \frac{9}{9} = \frac{6}{9}$; 18 yr. $= \frac{6}{9}$; $\frac{1}{9} = 3$ yr.; $\frac{5}{9} = 15$ yr.

13. Let $\frac{9}{9} =$ the whole length; then $\frac{9}{9} - \frac{2}{9} = \frac{7}{9}$; $\frac{7}{9} = 28$ yd.; $\frac{1}{9} = 4$ yd.; $\frac{9}{9} = 36$ yd.

14. Let $\frac{3}{6} =$ the distance from A to B, and $\frac{6}{6}$ the distance from C to D; $\frac{2}{3}$ of $\frac{3}{6}$ are $\frac{6}{18} = \frac{2}{6}$. $\frac{2}{6} + 20 = \frac{6}{6}$; then $20 = \frac{4}{6}$; $\frac{1}{6} = 5$; $\frac{6}{6} = 30$, the distance from C to D; $\frac{3}{6} = 15$, the distance from A to B.

15. Let $\frac{1}{15} =$ my age; $\frac{1}{15} + \frac{5}{15} + \frac{3}{15} = \frac{23}{15}$; $\frac{2}{3}$ of 69 years $= 46$ years; $\frac{23}{15} = 46$ years; $\frac{1}{15} = 2$ years; $\frac{1}{15} = 30$ years.

LESSON LIX.

4. As many lots as $\frac{3}{8}$ are contained times in $\frac{8}{8}$, which are $2\frac{2}{3}$.

5. In $2\frac{1}{2}$ days are $\frac{5}{2}$ days; in $\frac{1}{2}$ day he would do $\frac{1}{5}$ of the work; in 1 day he would do $\frac{2}{5}$ of the work.

7. In $3\frac{1}{3}$ days are $\frac{10}{3}$ days. In $\frac{1}{3}$ of a day he would walk $\frac{1}{10}$; in 1 day, $\frac{3}{10}$; in 2 days, $\frac{6}{10} = \frac{3}{5}$.

8. Both do $\frac{1}{2} + \frac{1}{4}$, which are $\frac{3}{4}$.

9. All do the sum of $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{5}$, which is $\frac{19}{20}$.

11. A digs $\frac{1}{6}$ in 1 day; B digs $\frac{1}{12}$ in 1 day; both dig $\frac{3}{12} = \frac{1}{4}$ in 1 day. If they dig $\frac{1}{4}$ in 1 day, it will take 4 days to dig the whole trench.

12. C does $\frac{1}{5}$ in 1 day; B does $\frac{1}{7}$ in 1 day; both do $\frac{12}{35}$ in 1 day. It will take as many days to do it all as $\frac{12}{35}$ are contained times in $\frac{35}{35}$, which are $2\frac{11}{12}$.

13. A can do $\frac{1}{2}$ in 1 day, B $\frac{1}{3}$, and C $\frac{1}{6}$; all do in 1 day the sum of $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{6}$, which is $\frac{6}{6}$. Therefore, all three do it in 1 day.

15. Both drink $\frac{1}{12}$ in 1 day; the woman drinks $\frac{1}{30}$ in 1 day; the man drinks $\frac{1}{12} - \frac{1}{30} = \frac{1}{20}$ in 1 day. If he drink $\frac{1}{20}$ in 1 day, he would drink it all in 20 days.

16. All do $\frac{1}{4}$ in 1 day; A and B do $\frac{1}{8} + \frac{1}{12} = \frac{5}{24}$ in 1 day; C does in 1 day $\frac{1}{4} - \frac{5}{24} = \frac{1}{24}$. Therefore, C can reap it all in 24 days.

17. Both do in 1 day $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$. If they do $\frac{5}{6}$ in 1 day, they would do it all in $1\frac{1}{5}$ days.

18. A digs $\frac{2}{5}$ in 1 day, and B digs $\frac{3}{10}$ in 1 day; both dig $\frac{2}{5} + \frac{3}{10} = \frac{7}{10}$ in 1 day. Therefore, if they dig $\frac{7}{10}$ in 1 day, they would dig it all in $1\frac{3}{7}$ days.

19. C reaps $\frac{1}{3}$ in 1 day; D reaps $\frac{3}{10}$ in 1 day; both reap in 1 day $\frac{1}{3} + \frac{3}{10} = \frac{5}{10} = \frac{1}{2}$. If they reap $\frac{1}{2}$ in 1 day, they would reap the whole in 2 days.

LESSON LX.

8. The ratio of 21 to 7 is 3; $36 \div 3 = 12$, the number.

9. The ratio of 20 to 2 is 10; $10 - 5 = 5$, 5 is $\frac{1}{4}$ of 20, and 20 is the ratio of 40 to 2.

10. The ratio of 18 to 2 is 9, $+ 3 = 12$, $+ 7 = 19$; and 19 is the ratio of 38 to 2.

11. The ratio of 27 to 9 is 3, $+ 5 = 8$; and 8 is the ratio of 20 to $2\frac{1}{2}$.

13. Five $+ 7 = 12$; $\frac{5}{12}$ of 48 $= 20$, the first part; $\frac{7}{12}$ of 48 $= 28$, the second part.

18. Once the number $+ 3$ times the number $= 4$ times the number, or 48; and $\frac{1}{4}$ of 48 is 12, the number.

19. One $+ 4 = 5$; the first is $\frac{1}{5}$ of 25 yd. $= 5$ yd.; the second is $\frac{4}{5}$ of 25 yd. $= 20$ yd.

22. The first has $\frac{2}{3}$ of $7\frac{1}{2}$ doz. $= 5$ doz.; the second has $\frac{1}{3}$ of $7\frac{1}{2}$ doz. $= 2\frac{1}{2}$ doz.

23. A paid $\frac{25}{40} = \frac{5}{8}$ of the cost, and B paid $\frac{15}{40} = \frac{3}{8}$ of the cost. A should receive $\frac{5}{8}$ of \$56 $= \$35$, and B should receive $\frac{3}{8}$ of \$56 $= \$21$.

24. Three $+ 2 = 5$. C's loss was $\frac{2}{5}$ of \$30 $= \$12$; D's loss was $\frac{3}{5}$ of \$30 $= \$18$.

LESSON LXI.

3. Three thirds $+\frac{4}{3}=\frac{7}{3}$. A has $\frac{3}{7}$ of 14 ct. = 6 ct.; B has $\frac{4}{7}$ of 14 ct. = 8 ct.

5. In $2\frac{1}{2}$ are $\frac{5}{2}$, and $4\frac{1}{2}=\frac{9}{2}$; $\frac{5}{2}+\frac{9}{2}=\frac{14}{2}$. The first would receive $\frac{5}{14}$ of \$28 = \$10; the second would receive $\frac{9}{14}$ of \$28 = \$18.

6. Three thirds $+\frac{5}{3}=\frac{8}{3}$. William's age is $\frac{5}{8}$ of 32 yr. = 20 yr.; Frank's age is $\frac{3}{8}$ of 32 yr. = 12 yr.

7. Three thirds $+\frac{7}{3}=\frac{10}{3}$. $\frac{7}{10}$ of 30 apples = 21 apples, the number of sound ones; $\frac{3}{10}$ of 30 apples = 9 apples, the number not sound.

8. Four fifths $+\frac{5}{5}=\frac{9}{5}$. One built $\frac{4}{9}$ of 27 ft. = 12 ft.; the other, $\frac{5}{9}$ = 15 ft.

10. One $+2+3+4=10$. The first part is $\frac{1}{10}$ of 70 = 7; the second, $\frac{2}{10}$ of 70 = 14; the third, $\frac{3}{10}$ of 70 = 21; the fourth, $\frac{4}{10}$ of 70 = 28.

11. One half $=\frac{6}{12}$; $\frac{1}{3}=\frac{4}{12}$; $\frac{1}{4}=\frac{3}{12}$; and $\frac{6}{12}+\frac{4}{12}+\frac{3}{12}=\frac{13}{12}$. The first is $\frac{6}{13}$ of 39 = 18; the second, $\frac{4}{13}$ = 12; the third is $\frac{3}{13}$ = 9.

12. All had 3 ct. + 4 ct. + 5 ct. = 12 ct. William's share, $\frac{3}{12}$ of 36, = 9; Thomas's, $\frac{4}{12}$ of 36, = 12; John's, $\frac{5}{12}$ of 36, = 15.

13. The whole loss was \$864 — \$500 = \$364; $\frac{1}{8}$ of \$364 is \$45 $\frac{1}{2}$, A's loss; $\frac{1}{4}$ of \$364 is \$91, B's loss; $\frac{5}{8}$ of \$364 are \$227 $\frac{1}{2}$, C's loss.

14. A has $\frac{4}{4}$, B $\frac{2}{4}$, and C $\frac{1}{4}$; all have $\frac{4}{4} + \frac{2}{4} + \frac{1}{4} = \frac{7}{4}$. A has $\frac{4}{7}$ of $\$42 = \24 ; B has $\frac{2}{7}$ of $\$24 = \12 ; and C has $\frac{1}{7}$ of $\$24 = \6 .

15. $Four + 3 + 2 = 9$. A has $\frac{4}{9}$, B $\frac{3}{9}$, and C $\frac{2}{9}$, or 20, 15, and 10, respectively.

16. $One + 3 + 6 = 10$. $\frac{1}{10}$ of 60 = 6, the horses; $\frac{3}{10}$ of 60 = 18, the cows; $\frac{6}{10}$ of 60 = 36, the sheep.

17. $One + 2 + 3 = 6$. A has $\frac{1}{6}$ of 42 = 7; B, $\frac{2}{6} = 14$; C, $\frac{3}{6} = 21$.

18. $One + 2 + 4 = 7$. Emma has $\frac{1}{7}$ of 35 = 5; Agnes has $\frac{2}{7}$ of 35 = 10; Sarah has $\frac{4}{7}$, = 20.

LESSON LXII.

2. It will take 15 times 8 men = 120 men to do the work in 1 day; to do it in 12 days it will take $\frac{1}{12}$ of 120 men = 10 men.

4. One will fill it in 9 times $2\frac{1}{2}$ hr. = $22\frac{1}{2}$ hr.; then 5 pipes will fill it in $\frac{1}{5}$ of $22\frac{1}{2}$ hr. = $4\frac{1}{2}$ hr

6. Fifteen ct. = $\$ \frac{3}{20}$; 80 times $\$ \frac{3}{20} = \$ \frac{240}{20} = \12 .

7. Sixty ct. = $\$ \frac{3}{5}$; 80 times $\$ \frac{3}{5} = \$ \frac{240}{5} = \48 .

10. It will make 3 times 20 = 60 one cent loaves. $\frac{1}{4}$ of 60 = 15 four cent loaves; $\frac{1}{5}$ of 60 = 12 five cent loaves.

11. A loaf will weigh 3 times 8 oz. = 24 oz., when flour is \$1 a barrel; it will weigh $\frac{1}{4}$ of 24 oz. = 6 oz., when flour is \$4 a barrel.

12. Six times 10 oz. = 60 oz.; $\frac{1}{5}$ of 60 oz. = 12 oz.

13. In $\$5\frac{1}{3}$ are $\$1\frac{6}{3}$; $\frac{1}{3}$ times 7 oz. = $\frac{11}{3}$ oz.; $\$4\frac{2}{3} = \$1\frac{4}{3}$. When flour is worth $\$4\frac{2}{3}$ a barrel, a loaf will weigh as many oz. as $\frac{1}{3}$ are contained times in $\frac{11}{3} = 8$.

14. It will take 5 times 5 men = 25 men to do the same work in $\frac{1}{5}$ of the time; to do twice as much will take 2 times 25 men = 50 men.

15. Six men will do $\frac{1}{2}$ of it in $\frac{1}{2}$ of 5 days = $2\frac{1}{2}$ days; one man will do the other $\frac{1}{2}$ in 6 times $2\frac{1}{2}$ days = 15 days. $6 + 3 = 9$; 9 men will do it in $\frac{1}{9}$ of 15 days = $1\frac{2}{3}$ days. Therefore, the whole time is $2\frac{1}{2}$ days + $1\frac{2}{3}$ days = $4\frac{1}{6}$ days.

16. Seven men will do $\frac{1}{2}$ of the work in 2 days; one man will do the other half in 7 times 2 days = 14 days. $7 - 3 = 4$; 4 men will do it in $\frac{1}{4}$ of 14 days = $3\frac{1}{2}$ days. Therefore, it will take 2 days + $3\frac{1}{2}$ days = $5\frac{1}{2}$ days to do the whole work.

18. One man would spend $\frac{1}{6}$ of $\$36 = \6 in 8 days; in 1 day he would spend $\frac{1}{8}$ of $\$6 = \$\frac{6}{8}$. 5 persons would spend 5 times $\$ \frac{6}{8} = \$\frac{30}{8}$ in 1 day; in 12 days, 12 times $\$ \frac{30}{8} = \$\frac{360}{8} = \$45$.

19. One third of 12 rd. is 4 rd.; $\frac{1}{8}$ of 4 rd. is $\frac{4}{8}$ rd. = $\frac{1}{2}$ rd.; 5 times $\frac{1}{2}$ rd. = $\frac{5}{2}$ rd.; 3 times $\frac{5}{2}$ rd. = $\frac{15}{2}$ rd. = $7\frac{1}{2}$ rd.

20. One sixth of 36 bu. = 6 bu.; $\frac{1}{10}$ of 6 bu. = $\frac{3}{5}$ bu.; 5 times $\frac{3}{5}$ bu. = $\frac{15}{5}$ bu.; 9 times $\frac{15}{5}$ bu. = $\frac{135}{5}$ bu. = 27 bu.

21. One man will eat 2 B. in 5 times 6 days = 30 days; one man will eat 8 B. in 4 times 30 days = 120 days; 12 men will eat 8 B. in $\frac{1}{12}$ of 120 days = 10 days.

22. One person would spend $\frac{1}{8}$ of \$400 = \$50 in 5 months; in 1 month he would spend $\frac{1}{5}$ of \$50 = \$10; in 8 mo. 1 person would spend 8 times \$10 = \$80, and 11 persons would spend 11 times \$80 = \$880.

23. One ox can be kept on $\frac{1}{10}$ of 5 T. = $\frac{1}{2}$ T. for 3 mo.; one ox can be kept 1 mo. on $\frac{1}{3}$ of $\frac{1}{2}$ T. = $\frac{1}{6}$ T.; for 5 mo. on 5 times $\frac{1}{6}$ T. = $\frac{5}{6}$ T. 15 T. = $\frac{90}{6}$ T., and $\frac{90}{6}$ T. will keep as many oxen as $\frac{5}{6}$ are contained times in $\frac{90}{6}$ = 18. If 7 sheep eat as much as an ox, it will keep 18 times 7 sheep = 126 sheep.

LESSON LXIII.

2. One horse eats as much as $1\frac{1}{2}$ cows, and 14 horses eat as much as 21 cows; 15 cows + 21 cows = 36 cows. A pays $\frac{21}{36}$ = $\frac{7}{12}$ of \$60 = \$35; B pays $\frac{15}{36}$ = $\frac{5}{12}$ of \$60 = \$25.

3. B's 120 sheep = 6 horses; his 15 oxen = 10 horses; then B has the same as 6 horses + 10 horses = 16 horses. Both have 16 horses + 8 horses = 24 horses. A pays $\frac{8}{24}$, or $\frac{1}{3}$, of \$72 = \$24; B pays $\frac{2}{3}$ of \$72 = \$48.

5. C's \$50 for 4 mo. = \$200 for 1 mo.; D's \$60 for 5 mo. = \$300 for 1 mo.; \$200 + \$300 = \$500. C has $\frac{2}{5}$ of \$45 = \$18; D has $\frac{3}{5}$ of \$45 = \$27.

6. Three men for 4 days = 12 men 1 day; 5 men 3 days = 15 men 1 day; 12 men + 15 men = 27 men. A receives $\frac{4}{9}$ of \$81 = \$36; B receives $\frac{5}{9}$ of \$81 = \$45.

7. A's \$2 for 5 mo. = \$10 for 1 mo.; B's \$3 for 4 mo. = \$12 for 1 mo.; $\$10 + \$12 = \$22$. A receives $\frac{5}{11}$ of \$55 = \$25; B, $\frac{6}{11} = \$30$.

8. E's 4 horses = 6 cows; 6 cows for 5 mo. = 30 cows 1 mo.; F's 10 cows for 6 mo. = 60 cows 1 mo.; 30 cows + 60 cows = 90 cows. E pays $\frac{1}{3}$ of \$27 = \$9; F pays $\frac{2}{3}$ of \$27 = \$18.

9. The net gain is $\$300 - \$150 = \$150$; $\$600 + \$900 = \$1500$. M has $\frac{2}{5}$ of \$150 = \$60; N has $\frac{3}{5}$ of \$150 = \$90.

10. C's capital = \$600 for 12 mo., or \$7200 for 1 mo.; D's = \$600 for 8 mo., or \$4800 for 1 mo.; $\$7200 + \$4800 = \$12000$. C has $\frac{720}{1200} = \frac{3}{5}$ of \$250 = \$150; D has $\frac{480}{1200} = \frac{2}{5}$ of \$250 = \$100.

11. E had \$1000 for 12 mo. = \$12000 for 1 mo.; F had \$3000 for 12 mo. = \$36000 for 1 mo., less \$1000 for 4 mo. = \$4000 for 1 mo., and $\$36000 - \$4000 = \$32000$; $\$32000 + \$12000 = \$44000$. E has $\frac{3}{11}$ of \$770 = \$210; F has $\frac{8}{11}$ of \$770 = \$560.

12. $\$240 - \$20 = \$220$; B's share is $\frac{1}{2}$ of \$220 = \$110; A's share is $\$110 + \$20 = \$130$. B has $\frac{110}{240} = \frac{11}{24}$ of the gain, and also $\frac{11}{24}$ of the capital, \$240, = \$110; A has $\frac{13}{24}$ of the gain, and also $\frac{13}{24}$ of \$240, = \$130.

13. Since D's time was only $\frac{3}{4}$ of C's, he must have had $\frac{1}{4}$ more capital than C; then $\frac{4}{4} =$ D's capital, and $\frac{3}{4} =$ C's capital; $\frac{4}{4} + \frac{3}{4} = \frac{7}{4}$, and $\frac{7}{4} = \$980$. $\frac{1}{4} = \frac{1}{7}$ of \$980 = \$140; $\frac{4}{4} = \$560$, D's capital; $\frac{3}{4} = \$420$, C's capital.

Key 3.

14. A's gain per mo. was $\frac{1}{10}$ of \$70 = \$7; B's gain per mo. was $\frac{1}{8}$ of \$80 = \$10. Both gained $\$7 + \$10 = \$17$ per mo. If A has $\frac{7}{17}$ of the gain, his capital is $\frac{7}{17}$ of \$1700 = \$700; B's capital is $\frac{10}{17}$ of \$1700 = \$1000.

15. The ratio of their stock was as 2 to 3, and of the time as 10 to 12; $2 \times 10 = 20$; $3 \times 12 = 36$; $20 + 36 = 56$. E's gain was $\frac{5}{14}$ of \$840 = \$300; F's gain was $\frac{9}{14}$ of \$840 = \$540.

LESSON LXVII.

8. $\frac{30}{45} = \frac{2}{3} = 66\frac{2}{3}$ per cent.

9. He gains $\frac{5}{25} = \frac{1}{5}$, and $\frac{1}{5} = 20$ per cent.

14. He gains $\$24 - \$15 = \$9$; $\$9 = \frac{3}{5}$ of the cost, or 60 per cent.

15. In 5 gal. are 20 qt. He lost $\frac{6}{20} = \frac{3}{10} = 30$ per cent.

16. Six cents = $\frac{6}{5}$ of the cost; $\frac{5}{5} = 5$ cents, the cost; 8 ct. — 5 ct. = 3 ct.; $\frac{3}{5} = 60$ per cent.

17. He paid $\frac{1}{6}$ of \$3 = 50 cents for 1 yd.; he sold 1 yd. for $\frac{1}{5}$ of \$4 = 80 ct.; 80 ct. — 50 ct. = 30 ct.; $\frac{30}{50} = \frac{3}{5} = 60$ per cent.

18. Eight ct. = $\frac{4}{5}$ of the cost; $\frac{5}{5} = 10$ ct., the cost. $\frac{1}{5}$ of 25 ct. = $8\frac{1}{5}$ ct.; $10 - 8\frac{1}{5} = 1\frac{4}{5} = \frac{12}{10} = \frac{6}{5} = \frac{1}{5} = 16\frac{2}{3}$ per cent loss. $\frac{1}{2}$ of 25 ct. = $12\frac{1}{2} - 10 = 2\frac{1}{2}$; $\frac{2\frac{1}{2}}{10} = \frac{5}{20} = \frac{1}{4}$; $\frac{1}{4} = 25$ per cent gain.

19. One lemon cost $\frac{1}{2}$ of 3 ct. = $1\frac{1}{2}$ ct. He sold 1 lemon for $\frac{1}{3}$ of 2 ct. = $\frac{2}{3}$ ct. $1\frac{1}{2} = \frac{9}{6}$; $\frac{2}{3} = \frac{4}{6}$; $\frac{9}{6} - \frac{4}{6} = \frac{5}{6}$; $\frac{5}{6}$ are $\frac{5}{9}$ of $\frac{9}{6}$, and $\frac{5}{9} = 55\frac{5}{9}$ per cent.

LESSON LXVIII.

2. $\$26 = 130$ per cent of the cost, or $\frac{13}{10}$; $\frac{1}{10} = \frac{1}{13}$ of $\$26 = \2 ; $\frac{10}{10} = \$20$, the cost.

3. Fourteen cents $= \frac{14}{10}$ of the cost; $\frac{1}{10}$ is $\frac{1}{14}$ of 14 ct. $= 1$ ct.; $\frac{10}{10} = 10$ ct., the cost.

4. $\$81 = \frac{9}{8}$ of the cost; $\frac{1}{8} = \$9$; $\frac{8}{8} = \$72$.

5. $\$63 = \frac{9}{10}$ of the cost; $\frac{1}{10} = \$7$; $\frac{10}{10} = \$70$.

6. $\$21 = \frac{7}{4}$ of the cost; $\frac{1}{4} = \$3$; $\frac{4}{4} = \$12$.

7. Forty ct. $= \frac{4}{3}$ of the cost; $\frac{1}{3} = 10$ ct.; $\frac{3}{3} = 30$ ct. Each orange cost $\frac{1}{10}$ of 30 ct. $= 3$ ct.

8. $\$10 = \frac{5}{4}$ of the cost; $\frac{1}{4} = \$2$; $\frac{4}{4} = \$8$, the cost; $\$12 - \$8 = \$4$. He would gain $\frac{4}{8} = 50$ per cent.

9. Seven ct. $= \frac{7}{8}$ of the cost; $\frac{1}{8} = 1$ ct.; $\frac{8}{8} = 8$ ct., the cost. 8 ct. $- 6$ ct. $= 2$ ct.; and 2 ct. are $\frac{1}{4}$ of the cost $= 25$ per cent loss.

10. $\$35 = \frac{5}{6}$ of the cost; $\frac{1}{6} = \$7$; $\frac{6}{6} = \$42$, the cost. $\$63 - \$42 = 21$; $\$21$ is $\frac{1}{2}$ of the cost $= 50$ per cent gain.

11. $\$18 = \frac{6}{5}$ of its value; $\frac{5}{5} = \$15$, its value; 10 per cent of $\$15$ is $\frac{1}{10}$ of $\$15 = \1.50 ; $\$18 - \$15 = \$3$. He lost $\$3 + \$1\frac{1}{2} = \$4\frac{1}{2}$.

12. $\$60 = \frac{6}{5}$ of the cost; $\frac{5}{5} = \$50$, the cost. A gained $\$60 - \$50 = \$10$; B lost 20 per cent, or $\frac{1}{5}$ of $\$60 = \12 . B lost $\$12 - \$10 = \$2$ more than A gained.

13. $\$30 = \frac{5}{4}$ of the cost of the first; $\frac{4}{4} = \$24$, the cost. The gain was $\$30 - \$24 = \$6$. $\$30 = \frac{3}{4}$ of the cost of the second; $\frac{4}{4} = \$40$, the cost. The loss on the watch was $\$40 - \$30 = \$10$; loss by sale $\$10 - \$6 = \$4$.

14. One apple sold for $\frac{1}{4}$ of 3 ct. $= \frac{3}{4}$ ct.; $\frac{3}{4}$ ct. $= 150\%$, or $\frac{3}{2}\%$ of the cost. $\frac{1}{2} = \frac{1}{4}$ ct.; $\frac{2}{2} = \frac{2}{4}$ ct. $= \frac{1}{2}$ ct., the cost. 5 apples for 4 ct. $= \frac{4}{5}$ ct. for 1 apple. Gain $\frac{4}{5} - \frac{1}{2} = \frac{3}{10}$, and $\frac{3}{10} = \frac{3}{10}$ of $\frac{5}{10}$, or 60 per cent.

15. One lemon sold for $\frac{4}{5}$ ct.; $\frac{4}{5}$ ct. $= \frac{4}{5}$ per cent of the cost; 1 ct. $=$ the cost; 6 for 5 ct. $= \frac{5}{6}$ ct. for 1; 1 ct. $= \frac{5}{6}$ ct. $= \frac{1}{6}$ ct.; $\frac{1}{6}$ of 1 ct. $= 16\frac{2}{3}$ per cent.

16. Ten per cent of 60 $= 6$; $\frac{2}{3}$ of 6 $= 4$; 4 is $\frac{1}{2}$ of 8; $8 = \frac{1}{5}$, or 20 per cent, of 40.

17. Fifty per cent of 120 $= 60$; $\frac{3}{5}$ of 60 $= 36$; $\frac{1}{2}$ of 36 $= 18$; 18 is 10 less than 28, and 28 is 20 per cent, or $\frac{1}{5}$, of 140.

18. Sixty per cent of 10 is 6; $\frac{2}{3}$ of 6 $= 4$; $\frac{1}{4}$ of 4 $= 1$. 1 is 5 less than 6, and 6 is 50 per cent, or $\frac{1}{2}$, of 12.

19. Seventy-five per cent of 15 $= \frac{45}{4}$; $\frac{2}{5}$ of $\frac{45}{4} = \frac{18}{4}$; $\frac{3}{4}$ of $\frac{18}{4} = \frac{27}{8}$; $\frac{27}{8}$ are $1\frac{3}{8}$ more than $\frac{71}{40}$, and $\frac{71}{40}$ are 50 per cent, or $\frac{1}{2}$, of $\frac{142}{40} = 3\frac{1}{10}$.

20. Twenty-five per cent of 4 is 1; $\frac{2}{3}$ of 1 $= \frac{2}{3}$; $\frac{3}{2}$ times $\frac{2}{3} = \frac{3}{3} = 1$; 1 is 25 per cent, or $\frac{1}{4}$, of 4; and 4 is $\frac{1}{2}$ of 8.

LESSON LXIX.

1. One fifth of \$3 is 60 ct.; $\$3 - 60$ ct. $= \$2.40$.

2. One fifth of \$125 $= \$25$; $\$125 - \$25 = \$100$.

3. One sixth of $\$840 = \140 ; $\$840 - \$140 = \$700$.

4. Twenty% $= \frac{1}{5}$; $\frac{1}{5}$ of $\$500 = \100 ; $\$500 - \$100 = \$400$. 5% $= \frac{1}{20}$; $\frac{1}{20}$ of $\$400 = \20 ; $\$400 - \$20 = \$380$.

5. One sixth of $\$1200 = \200 ; $\$1200 - \$200 = \$1000$. 5% $= \frac{1}{20}$; $\frac{1}{20}$ of $\$1000 = \50 ; $\$1000 - \$50 = \$950$.

6. $\$4.80 = \frac{4}{5}$ of the retail price; $\frac{1}{5} = \$1.20$; $\frac{5}{5} = \$6$.

7. $\$720 = \frac{2}{3}$ of the retail price; $\frac{1}{3} = \$360$; $\frac{3}{3} = \$1080$.

8. One hundred per cent less 5 per cent $= 95\%$, or $\frac{19}{20}$; $\frac{19}{20} = \$133$; $\frac{1}{20} = \$7$; $\frac{20}{20} = \$140$. $\$140$ is $\frac{4}{5}$ of the list price; $\frac{1}{5} = \$35$; $\frac{5}{5} = \$175$.

9. $\$399 = \frac{19}{20}$ of the remainder after $\frac{1}{8}$ per cent discount; $\frac{1}{20} = \$21$; $\frac{20}{20} = \$420$. $\$420 = \frac{7}{8}$ of the list price; $\frac{1}{8} = \$60$; $\frac{8}{8} = \$480$.

10. $\$50$ less $\frac{1}{5} = \$40$; $\$40$ less $\frac{1}{20} = \$38$; $\$20$ less $\frac{1}{10} = \$18$; $\$18$ less $\frac{1}{20} = \$17.10$; $\$38 + \$17.10 = \$55.10$.

LESSON LXX.

1. His commission was $2\frac{1}{2}$ per cent, or $\frac{1}{40}$, of $\$4000$, $= \$100$.

2. One twentieth of $\$560 = \28 .

3. The corn cost 1000 times 50 ct. $= \$500$; $\frac{1}{40}$ of $\$500 = \12.50 .

4. Five times $\$300 = \1500 ; $\frac{1}{20}$ of $\$1500 = \75 . The owner receives $\$1500 - \$75 = \$1425$.

5. The wheat sells for 800 times $\$1.25 = \1000 ; $\frac{1}{50}$ of $\$1000 = \20 , the commission; $\$1000 - \$20 = \$980$.

6. $\$100 = \frac{1}{20}$ of $\$2000$.

7. $\$60 = \frac{1}{10}$; $\frac{10}{10} = \$600$.

8. The commission was $\frac{1}{20}$ of $\$1000 = \50 ; $\$1000 - \$50 = \$950$. He bought as many shares as $\$50$ are contained times in $\$950 = 19$.

LESSON LXXI.

1. One per cent of $\$2000 = \20 ; $\frac{1}{2}\%$ of $\$20 = \10 .

2. One half of $\$3000 = \1500 ; $\frac{1}{50}$ of $\$1500 = \30 .

3. Two thirds of $\$2400 = \1600 ; 1% of $\$1600$ is $\$16$, and $\$16 + \$1.50 = \$17.50$.

4. $\$2500 + \$1500 = \$4000$; 1% of $\$4000$ is $\$40$; $\frac{3}{4}\%$ is $\frac{3}{4}$ of $\$40 = \30 .

5. Two thirds of $\$1800$ are $\$1200$; $\frac{1}{100}$ of $\$1200$ is $\$12$; $\frac{2}{3}$ of $\$1200$ are $\$800$; 1% of $\$800$ is $\frac{1}{100}$ of $\$800 = \8 ; $\frac{1}{2}\%$ is $\frac{1}{2}$ of $\$8 = \4 ; and $\$12 + \$4 + \$1 = \17 .

6. One half of $\$2600 = \1300 ; $\frac{1}{50}$ of $\$1300 = \26 ; $\frac{2}{3}$ of $\$1500$ are $\$1000$; $\frac{1}{100}$ of $\$1000$ is $\$10$; and $\$26 + \$10 + \$1.50 = \37.50 .

LESSON LXXII.

4. The interest on $\$1$ for 1 year is 8 ct.; for 3 yr. 3 times 8 ct. = 24 ct.; for $\$20$ it is 20 times 24 ct. = $\$4.80$.

5. The interest on \$1 for 6 yr. at 4% is 24 ct.; and for \$25 it is 25 times 24 ct. = \$6.

6. The interest for \$1 is 20 ct.; for \$40 it is \$8.

7. \$9. (8.) \$8.40.

9. \$9. (10.) \$36.

LESSON LXXIII.

2. Four mo. = $\frac{1}{3}$ of a year. The interest on \$1 for 4 mo. is $\frac{1}{3}$ of 5 ct. = $1\frac{2}{3}$ ct.; on \$60 it is 60 times $1\frac{2}{3}$ ct. = \$1.

3. The interest on \$1 for 7 mo. at 6% is $3\frac{1}{2}$ ct.; on \$80 it is \$2.80.

4. On \$1 it is $\frac{3}{4}$ of 8 ct. = 6 ct.; on \$40 it is \$2.40.

5. Two thirds of 9 ct. = 6 ct.; 75 times 6 ct. = \$4.50.

7. The interest for 1 year is 180 times 4 ct. = \$7.20; for 1 mo. $\frac{1}{12}$ of \$7.20 = \$0.60; for 10 mo. 10 times 60 ct. = \$6; for 10 days $\frac{1}{3}$ of 60 ct. = 20 ct.; for 10 mo. 10 da., \$6.20.

9. One year's interest = \$12; 1 mo. interest = \$1; for 4 mo. \$4; for 24 days $\frac{4}{5}$ of \$1 = 80 ct.; for 4 mo. 24 da., \$4.80.

10. The int. for 1 yr. is \$24; for 1 mo. \$2; for 9 mo. \$18; for \$18 $\frac{2}{3}$ of \$2 = \$1.20; for 9 mo. 18 da. it is \$19.20.

11. \$8.45,

12. The int. for 1 yr. is \$5.76; for 1 mo. 48 ct.; for 8 mo. \$3.84; for 25 da. $\frac{5}{8}$ of 48 ct. = 40 ct.; for 8 mo. 25 da., $\$3.84 + \$0.40 = \$4.24$.

13. \$3.20. (14.) \$6.75. (15.) \$3.80.

16. The int. for 1 year is \$1; for 3 yr. \$3. The amount is $\$25 + \$3 = \$28$.

17. \$44. (18.) \$68.20. (19.) \$32.80.

20. \$56.80. (21.) \$99.12.

LESSON LXXIV.

2. The int. for \$1 for 3 yr. at 4% is 12 ct. It will take as many dollars to acquire \$6 int. as 12 ct. are contained times in 600 ct., which are 50. *Ans.* \$50.

3. \$60. (4.) \$75. (5.) \$140.

6. \$240. (7.) \$350.

8. As many dollars as 5 ct. are contained times in \$200, which are 4000. *Ans.* \$4000.

LESSON LXXV.

2. The amount of \$1 for 3 yr. at 6% is \$1.18. It will take as many dollars to amount to \$236 as \$1.18 is contained times in \$236, which are 200.

3. \$500. (4.) \$250.

5. \$300. (6.) \$25.

7. The amount of \$1 for 2 yr. 6 mo. at 8% is \$1.20. It will take as many dollars to amount to \$60 as \$1.20 is contained times in \$60, which are 50. If $\$50 = \frac{2}{5}$ of the principal, $\frac{5}{3}$, or the whole, = \$125.

LESSON LXXVI.

2. The int. on \$40 for 1 yr. at 5% is \$2. To gain \$8, it will take 4 yr.

3. 2 yr. 6 mo. (4.) 2 yr. 8 mo.

5. $3\frac{3}{7}$ years. (6.) $6\frac{2}{3}$ yr. = 6 yr. 8 mo.

9. Any principal to treble itself must gain 200%. At 5% it will take as many years as 5 is contained times in 200 = 40.

LESSON LXXVII.

2. At 1 per cent the int. on \$50 for 5 yr. is \$2.50. To amount to \$20, the rate will be as many times 1% as \$2.50 are contained times in \$20, which are 8. Ans. 8 per cent.

3. Int. at 1% = \$2.25; $\$11.25 \div \$2.25 = 5$. Ans. 5%.

4. 7%.

5. Int. at 1% = \$6.75; $\$54.00 \div \$6.75 = 8$. Ans. 8%.

6. Int. at 1% = \$8; $\$56 \div \$8 = 7$. Ans. 7%.

7. \$240 less \$200 = \$40, the interest; int. at 1% = \$8; $\$40 \div \$8 = 5$. Ans. 5%.

8. \$183 less \$150 = \$33, the int.; int. at 1% = \$5.50;
 $\$33 \div \$5.50 = 6$. *Ans.* 6%.

LESSON LXXVIII.

2. The amount of \$1, for the given time and rate, is
 $\$1.30 = \frac{13}{10}$. $\$520 = \frac{52}{10}$; $\frac{1}{10} = \$40$; $\frac{3}{10} = \$120$, the dis-
 count; $\frac{10}{10} = \$400$, the present worth.

3. $\$30 = \frac{6}{5}$; $\frac{5}{5} = \$25$, present worth; $\$30 - \$25 = \$5$,
 discount.

4. Present worth, \$500; discount, \$250.

5. $\$345 = \frac{23}{20}$; $\frac{1}{20} = \$15$; $\frac{20}{20} = \$300$. $\$345 - \$300 =$
 $\$45$, discount.

6. \$96. (7.) \$4. (8.) \$50. (9.) \$44.

10. Int. for 6 yr. 8 mo. = 40 ct.; amt. of \$1 = \$1.40
 $= \frac{7}{5}$. $\$77 = \frac{7}{5}$; $\frac{1}{5} = \$11$; $\frac{5}{5} = \$55$, present worth.

11. Amt. of \$1 for 3 yr. 6 mo. at 7% is $\$1.24\frac{1}{2} = \frac{1245}{1000}$
 $= \frac{249}{200}$; $\frac{1}{200}$ is $\frac{1}{249}$ of \$1000 = $\$4\frac{4}{249}$; $\frac{200}{200} = \$803\frac{53}{249}$;
 $\$1000 - \$803\frac{53}{249} = \$196\frac{196}{249}$, discount.

12. Amt. of \$1 is $\$1.22 = \frac{61}{50}$; $\$900 = \frac{61}{50}$; $\frac{1}{50}$ is $\frac{1}{61}$ of
 $\$900 = \$14\frac{46}{61}$; $\frac{50}{50} = \$737\frac{43}{61}$; $\$900 - \$737\frac{43}{61} = \$162\frac{18}{61}$.

LESSON LXXIX.

1. For 4 yr. 2 mo. 25%; $\frac{25}{100} = \frac{1}{4}$.

2. For 5 yr. 25% int.; $100\% + 25\% = 125\%$, amt.;
 $\frac{25}{125} = \frac{1}{5}$.

3. For 1 yr. $\frac{1}{2}$ of $\frac{1}{5} = \frac{1}{10}$; $\frac{1}{10}$ of 100% is 10%.

4. Two yr. 6 mo. = 30 mo.; $\frac{1}{30}$ of $\frac{1}{4} = \frac{1}{120}$ for 1 mo.; 12 times $\frac{1}{120} = \frac{1}{10}$; $\frac{1}{10}$ of 100% = 10%.

5. The int. at 10% = $\frac{1}{10}$ of the principal in 1 yr.; to equal $\frac{3}{5}$, or $\frac{6}{10}$, it will take 6 yr.

6. The yearly interest is $\frac{1}{3}$ of $\frac{9}{25} = \frac{3}{25}$; $\frac{3}{25} = \frac{12}{100} = 12\%$.

7. The interest for 2 yr. is 5 times $\frac{4}{25} = \frac{20}{25} = \frac{4}{5}$; for 1 yr. $\frac{1}{2}$ of $\frac{4}{5} = \frac{2}{5}$; $\frac{2}{5} = \frac{40}{100} = 40\%$.

8. Five eighths of the interest for 1 yr. = $\frac{3}{80}$ of the principal. If $\frac{3}{80}$ are $\frac{5}{8}$, then $\frac{1}{8}$ is $\frac{1}{5}$ of $\frac{3}{80} = \frac{3}{400}$, and $\frac{8}{8} = \frac{24}{400} = \frac{6}{100} = 6\%$.

9. The int. for 4 mo. is $\frac{1}{50}$ of the principal; for 12 mo. 3 times $\frac{1}{50} = \frac{3}{50} = \frac{6}{100} = 6\%$. Int. for \$1 for 1 yr. 4 mo. = 8 ct.; for \$200 it is 200 times 8 ct. = \$16

10. One yr. 4 mo. = 16 mo., or 4 times 4 mo.; $\frac{1}{4}$ of $\frac{3}{25} = \frac{3}{100}$; $\frac{3}{4} = \frac{9}{100} = 9\%$. The interest of \$100 for 1 yr. 8 mo. 12 da., at 9%, is \$15.30.

11. In 2 times 4 yr. = 8 yr.

12. In $3\frac{1}{3}$ are $\frac{10}{3}$; $\frac{1}{3}$ is $\frac{1}{10}$ of \$40 = \$4; $\frac{3}{3} = \$12$; \$12, the int. for 1 yr. = 5%, or $\frac{1}{20}$ of the principal; the principal = $\frac{20}{1} = \$240$. A has 2 parts; B, 1 part; both, 3 parts. A has $\frac{2}{3}$ of \$240 = \$160; B has $\frac{1}{3} = \$80$.

13. In $1\frac{2}{5}$ are $\frac{7}{5}$; $\frac{1}{5} = \frac{1}{7}$ of \$49 = \$7; $\frac{5}{5} = \$35$. \$35 = $\frac{7}{100}$ of the principal; $\frac{1}{100} = \$5$; $\frac{100}{100} = \$500$. If twice A's money = 3 times B's, then once A's money = $1\frac{1}{2}$ times B's; B's, $\frac{2}{2}$; A's, $\frac{3}{2}$; both, $\frac{5}{2}$; $\frac{2}{2} = \$200$, B's money; $\frac{3}{2} = \$300$, A's money.

14. Two yr. 3 mo. = 27 mo. The int. for 1 mo. is $\frac{1}{27}$ of \$18 = $\frac{18}{27}$ = \$ $\frac{2}{3}$; for 1 yr. 12 times $\frac{2}{3}$ = \$8. \$8 is 4 per cent, or $\frac{4}{100}$, of $\frac{3}{4}$ of A's and $\frac{1}{2}$ of B's; $\frac{4}{100}$ is \$2; $\frac{100}{100}$ is \$200. $\frac{3}{4}$ of A's + $\frac{1}{2}$ of B's = \$200; but $\frac{1}{2}$ of A's = $\frac{2}{3}$ of B's, or $\frac{1}{4}$ of A's = $\frac{1}{3}$ of B's, and B's = $\frac{3}{4}$ of A's. Then, $\frac{6}{4}$ of B's = \$200, and B's money = \$133.33 $\frac{1}{3}$. Since B's = $\frac{3}{4}$ of A's = \$133.33 $\frac{1}{3}$, $\frac{1}{4}$ of A's = \$44.44 $\frac{4}{9}$, and $\frac{4}{4}$ or A's money = \$177.77 $\frac{7}{9}$.

LESSON LXXX.

1. One apple is worth $\frac{1}{8}$ of 24 plums = 3 plums; and 84 apples are worth 84 times 3 plums = 252 plums. One peach is worth $\frac{1}{12}$ of 252 plums = 21 plums; and 5 peaches are worth 105 plums.

2. Mary has 5 more than James, and Lucy 3 more than James. $5 + 3 = 8$, and $32 - 8 = 24$; $\frac{1}{3}$ of 24 = 8, James's share; $8 + 3 = 11$, Lucy's; $8 + 5 = 13$, Mary's.

3. Sixteen is twice the number; the number is 8.

4. C has $\frac{6}{6}$; B has $\frac{2}{6}$; A has $\frac{1}{6}$; C has $\frac{5}{6}$ more than A; $\frac{5}{6}$ = \$15; $\frac{1}{6}$ = \$3, A's; $\frac{6}{6}$ = \$18, C's; $\frac{2}{6}$ = \$6, B's.

5. Four fourths = James's money; $\frac{4}{4} + \frac{3}{4} = \frac{7}{4}$; \$34 - \$6 = \$28; \$28 = $\frac{7}{4}$; $\frac{1}{4}$ = \$4; $\frac{4}{4}$ = \$16, James's money; $\frac{3}{4} + $6 = $18, Thomas's money.$

6. Eight eighths less $\frac{3}{8} = \frac{5}{8}$; $\frac{1}{9}$ of $\frac{5}{8} = \frac{5}{72}$; $\frac{4}{9} = \frac{20}{72}$; $\frac{5}{8} = \frac{45}{72}$; and $\frac{45}{72} + \frac{20}{72} = \frac{65}{72}$; $\frac{1}{72} = \frac{1}{65}$ of 65 sheep = 1 sheep; $\frac{72}{72} = 72$ sheep.

7. One man will do the work in 12 da. of 10 hr., or in 120 da. of 1 hr. each; 8 men will do it in 15 da. of 1 hr., or in 2 $\frac{1}{2}$ da. of 6 hr.

8. At 2 for 3 ct., 1 dozen cost 6 times 3 ct. = 18 ct.; at 2 for 5 ct., 1 doz. cost 6 times 5 ct. = 30 ct., and 2 doz. cost 18 ct. + 30 ct. = 48 ct. At 3 for 7 ct., 1 doz. sold for 4 times 7 ct. = 28 ct.; 2 doz. cost 56 ct.; and 56 ct. — 48 ct. = 8 ct., the gain on 2 doz.; 4 ct., gain on 1 doz.

9. Four horses, 2 mo. = 8 horses 1 mo.; 9 cows, 3 mo. = 27 cows, 1 mo.; 20 sheep, 5 mo. = 100 sheep, 1 mo. If 10 sheep = 2 horses, 5 sheep = 1 horse, and 100 sheep = 20 horses; 1 cow = $\frac{2}{3}$ of a horse, and 27 cows = 18 horses. Then A has the same as 8 horses; B, 18; and C, 20; and all have 46. A pays $\frac{8}{46}$ of \$92 = \$16; B, $\frac{18}{46}$ = \$36; C, $\frac{20}{46}$ = \$40.

10. He gave to each pair \$5; and \$5 in \$20 are contained 4 times. He had 4 sons and 4 daughters.

12. Nine less 3 = 6; 4 — 2 = 2; $6 \div 2 = 3$, number of children.

14. One of John's steps = $1\frac{1}{4}$ of Henry's; 5 of John's = $6\frac{1}{4}$ of Henry's. He gains in taking 5 steps, $6\frac{1}{4}$ steps — 6 steps = $\frac{1}{4}$ step. He will take 4 times 5 steps = 20 steps to gain 1 step, and 7 times 20 steps = 140 steps to gain 7.

15. If 1 ox is worth 8 sheep, 3 oxen are worth 24 sheep, or 2 horses are worth 24 sheep; and 24 sheep are worth 24 times \$5 = \$120; 1 horse is worth $\frac{1}{2}$ of \$120 = \$60.

16. Two ct. + 24 ct. = 26 ct., and $\frac{1}{2}$ of 26 ct. = 13 ct., A's money; 13 ct. — 2 ct. = 11 ct., B's money.

17. Let $\frac{6}{6} = C$'s; $\frac{2}{6} = B$'s; $\frac{1}{6} = A$'s; then $\frac{6}{6} - \frac{2}{6} = \frac{4}{6}$, and $\frac{4}{6} = 20$ yr. $\frac{1}{6} = 5$ yr., A 's age; $\frac{2}{6} = 10$ yr., B 's age; $\frac{6}{6} = 30$ yr., C 's age.

18. If \$15 is $\frac{3}{4}$ of their difference, then \$20 = the whole of the difference. If $\frac{2}{3}$ of A 's = $\frac{4}{5}$ of B 's, $\frac{3}{3}$ of A 's = $\frac{6}{5}$ of B 's; $\frac{3}{3} = \frac{5}{5}$, and $\frac{6}{5} - \frac{5}{5} = \frac{1}{5}$, their difference; and $\frac{1}{5} = \$20$; $\frac{5}{5} = 100$, B 's; $\frac{6}{5} = \$120$, A 's.

19. One half of 17 is $8\frac{1}{2}$; and 10 less $8\frac{1}{2} = 1\frac{1}{2}$; and $1\frac{1}{2}$ in 15 is contained 10 times.

20. If 1 egg cost 2 ct., and 2 cost 6 ct., 3 cost 8 ct., and the average cost is $2\frac{2}{3}$ ct. 1 egg sells for $\frac{1}{3}$ of 10 ct. = $3\frac{1}{3}$ ct. The gain on 1 is $3\frac{1}{3} - 2\frac{2}{3} = \frac{2}{3}$; $\frac{2}{3}$ is $\frac{1}{4}$ of $2\frac{2}{3}$, or 25 per cent.

21. Eight less $5 = 3$; $21 \div 3 = 7$, number of play-mates.

22. John gains 2 steps every time he takes 7; to gain 30 steps he must take 7 steps as many times as 2 is contained in 30, or 15 times; 15 times 7 steps = 105 steps.

23. Let $\frac{7}{7} =$ the watch, and $\frac{2}{7} =$ the chain; three times $\frac{2}{7}$ plus 2 times $\frac{7}{7} = \frac{20}{7}$, and $\frac{20}{7} = \$100$; $\frac{1}{7} = \$5$; $\frac{2}{7} = \$10$, price of the chain; $\frac{7}{7} = \$35$, price of the watch.

24. In $4\frac{1}{2}$ are $\frac{9}{2}$; $2\frac{7}{8} = \frac{17}{8}$; A does $\frac{2}{3}$ in 1 day; both do $\frac{7}{18}$ in 1 day; $\frac{7}{18}$ less $\frac{2}{3} = \frac{3}{18} = \frac{1}{6}$, what B does in 1 day. If B does $\frac{1}{6}$ in 1 day, he would do it all in 6 days.

25. He gave $\frac{1}{2}$ ct. each for the first lot, and $\frac{1}{4}$ ct. each for the second lot; for two he gave $\frac{1}{2}$ ct. + $\frac{1}{4}$ ct. = $\frac{3}{4}$ ct.; average price, $\frac{3}{8}$ ct. He sold them for $\frac{3}{2}$ ct. each; gain on each, $\frac{3}{2} - \frac{3}{8} = \frac{9}{8}$. If he gained $\frac{9}{40}$ ct. on one, to gain 18 ct. it took as many pears as $\frac{9}{40}$ ct. is contained times in 18 ct. = 80.

26. He receives $\$59 - \$50 = \$9$ for 2 years' interest on $\$50$, or $\$4.50$ for each year. $\frac{4.50}{50} = 9\%$.

27. She wished to buy as many yards as $\frac{1}{2}$ is contained times in $5 = 10$.

28. A's money $= \frac{5}{5}$; B's money $= \frac{2}{5} - \$5$; $\frac{5}{5} + \frac{2}{5} - \$5 = \$51$; $\frac{7}{5} = \$56$; $\frac{1}{5} = \$8$; $\frac{5}{5} = \$40$, A's money; $\$51 - \$40 = \$11$, B's.

29. One third of the gain $= \frac{2}{15}$ of the selling price, and $\frac{3}{5} = \frac{6}{15}$, or $\frac{2}{5}$; $3\frac{3}{4}$ times $\$4 = \15 , the cost. If the gain is $\frac{2}{5}$ of the selling price, then $\frac{5}{5} - \frac{2}{5} = \frac{3}{5}$, or the cost; $\frac{3}{5} = \$15$; $\frac{5}{5} = \$25$, the selling price.

30. The hound gains 5 of the hare's leaps every time the hare takes 3; to gain 100, he must take 3 leaps as many times as 5 is contained in $100 = 20$, and 20 times $3 = 60$.

31. Thomas's age $= 3$ parts; James's $= 1$ part; 3 parts $- 1$ part $= 10$, the difference. If $10 = 2$ parts, then 5 yr. $=$ James's age, and 15 yr. $=$ Thomas's.

32. If $\frac{3}{7} = \frac{4}{5}$, then $\frac{7}{7} = \frac{28}{15}$; and $\frac{28}{15} + \frac{15}{15} = \frac{43}{15}$ of George's distance; $\frac{43}{15} = 86$ miles; $\frac{15}{15} = 2$ miles; $\frac{15}{15} = 30$ miles, George's distance; $\frac{28}{15} = 56$ miles, John's distance.

34. The difference between selling the lot at 6 ct. a doz. and 10 ct. a doz. is 12 ct. $+ 18$ ct. $= 30$ ct. The difference on 1 doz. is 10 ct. $- 6$ ct. $= 4$ ct. There were as many doz. as 4 ct. are contained times in 30 ct. $= 7\frac{1}{2}$ doz. The cost of the lot was $6 \times 7\frac{1}{2} + 12 = 57$ ct.; and the cost of 1 doz. was 57 ct. $\div 7\frac{1}{2} = 7\frac{2}{3}$ ct.

35. Let $\frac{10}{10} = A$'s age, and $\frac{5}{10} = B$'s; $\frac{2}{3}$ of $\frac{5}{10}$ are $\frac{1}{3}$, and $\frac{10}{10} + 44 = 2\frac{1}{2}$ times $\frac{10}{10} = \frac{25}{10}$. If $\frac{30}{10} + 44 = \frac{25}{10}$, then $\frac{22}{10} = 44$, and $\frac{10}{10} = 2$, and $\frac{10}{10} = 20$ yr., A 's age; $\frac{5}{10} = 10$ yr., B 's age.

36. Seven eighths of 24 miles = 21 miles. If 21 mi. are $\frac{3}{7}$, then $\frac{1}{7}$ is 7 mi., and $\frac{7}{7}$ are 49 mi., the distance from B to C ; 49 mi. + 24 mi. = 73 mi., distance from A to C .

37. A , B , and C together can do $\frac{1}{4}$ in 1 da.; A and B together can do $\frac{1}{8}$ in 1 da.; B and C together can do $\frac{1}{6}$ in 1 da.; C can do in 1 da. $\frac{1}{4} - \frac{1}{8} = \frac{1}{8}$, and the whole in 8 da.; A can do in 1 da. $\frac{1}{4} - \frac{1}{6} = \frac{1}{12}$, and the whole in 12 da.; B can do in 1 da. $\frac{1}{6} - \frac{1}{8} = \frac{1}{24}$, and the whole in 24 da.

38. One duck cost $\$ \frac{1}{6}$; 1 chicken, $\$ \frac{1}{8}$, and 2 chickens, $\$ \frac{2}{8}$; $\frac{1}{6} + \frac{2}{8} = \frac{10}{24}$; $\frac{1}{3}$ of $\frac{10}{24} = \frac{10}{72} = \frac{5}{36}$, the average cost. One third of $\frac{1}{2} = \frac{1}{6}$, the average selling price; $\frac{1}{6} = \frac{6}{36} - \frac{5}{36} = \frac{1}{36}$, the average gain; the whole gain was $\$ 2\frac{1}{2} = \$ \frac{5}{2}$; $\frac{5}{2} = \frac{90}{36}$; $\frac{90}{36} \div \frac{1}{36} = 90$, the whole number; $\frac{2}{3}$ of 90 = 60, the chickens; $\frac{1}{3}$ of 90 = 30, the ducks.

39. Eight ct. — 3 ct. = 5 ct.; 6 ct. + 29 ct. = 35 ct.; 35 ct. = $\frac{5}{8}$ of cost of oranges; $\frac{1}{8} = 7$ ct., and $\frac{8}{8} = 56$ ct.; 56 ct. — 6 ct. = 50 ct., James's money.

40. A rides $\frac{1}{3}$ of 10 miles in $\frac{1}{4}$ of an hour, and 8 miles in 1 hour; A will travel 18 miles in $18 \div 8 = 2\frac{1}{4}$ hr. B travels $\frac{1}{8}$ of a mile in $\frac{1}{5}$ hr., and 5 miles an hour; B will travel $2\frac{1}{4}$ times 5 mi. = $11\frac{1}{4}$ mi., while A travels 18 mi.

41. Three halves + $\$ 2\frac{1}{2} = \$ 40$; then $\frac{3}{2} = \$ 37\frac{1}{2}$; $\frac{1}{2} = \$ 12\frac{1}{2}$; $\frac{2}{2} = \$ 25$, his money.

42. C received $\frac{21}{21} - \frac{6}{21} - \frac{7}{21} = \frac{8}{21}$; $\frac{8}{21} - \frac{6}{21} = \frac{2}{21}$; $\frac{2}{21} = \$160$; $\frac{1}{21} = \$80$; $\frac{6}{21} = \$480$, A's legacy; $\frac{7}{21} = \$560$, B's legacy; $\frac{8}{21} = \$640$, C's legacy.

43. Both consume $\frac{6}{15}$ in 6 days, and $\frac{15}{15}$ less $\frac{6}{15} = \frac{9}{15} = \frac{3}{5}$ remaining. The woman consumes $\frac{1}{24}$ of $\frac{3}{5}$ in one day $= \frac{3}{120} = \frac{1}{40}$, and all in 40 days. Both consume $\frac{1}{15}$ in one day; $\frac{1}{15} - \frac{1}{40} = \frac{5}{120} = \frac{1}{24}$, what the man consumes in one day. It would last him alone 24 days.

44. Three and one half ct. $+ 6\frac{1}{2}$ ct. $= 10$ ct., the price of 2 pounds of the mixture; $100 \div 10 = 10$; 10 times 2 pounds $= 20$, the number of pounds.

45. Let $\frac{1}{10} =$ C's age; $\frac{2}{10} =$ B's; and $\frac{1}{10} =$ C's. $\frac{1}{10} - \frac{1}{10} = \frac{9}{10}$; $\frac{9}{10} = 45$ yr.; $\frac{1}{10} = \frac{1}{9}$ of 45 yr. $= 5$ yr., C's age; $\frac{2}{10} = 10$ yr., B's age; $\frac{1}{10} = 50$ yr. $=$ A's age.

46. Three fifths $=$ Mary's age, and $\frac{5}{5} =$ Ella's; their sum is $\frac{8}{5}$; twice Ella's is $\frac{10}{5}$; $\frac{10}{5} - \frac{8}{5} = \frac{2}{5}$, and $\frac{2}{5} = 6$ yr.; $\frac{1}{5} = 3$ yr.; $\frac{5}{5} = 15$ yr., Ella's age; $\frac{3}{5} = 9$ yr., Mary's age.

47. Both do $\frac{4}{16}$ in 4 days; and $\frac{16}{16} - \frac{4}{16} = \frac{3}{4}$, that B finishes in 36 days. In one day he does $\frac{1}{36}$ of $\frac{3}{4} = \frac{3}{144} = \frac{1}{48}$, and he does all in 48 days; $\frac{1}{16} - \frac{1}{48} = \frac{1}{24}$, what A does in 1 day, and he would do all in 24 days.

48. Three doz. at 1 ct. each $= 36$ ct.; 2 doz. at 4 eggs for 3 ct. $= 18$ ct.; 2 doz., the remainder, at 4 eggs for 5 ct. $= 30$ ct.; 36 ct. $+ 18$ ct. $+ 30$ ct. $= 84$ ct.; $84 = 7$ doz.; $\frac{1}{7}$ of 84 ct. $= 12$ ct. a doz.

Key 4.

50. If he had worked 30 days, he would have received 30 times 30 ct. = \$9. Each day he is idle he gives 20 ct. for board and forfeits 30 ct. for not working = 50 ct. $\$9 - \$5 = \$4$; $\$4.00 \div 50 \text{ ct.} = 8$, number of days idle; 30 days — 8 days = 22, number of days he worked.

51. The difference per yard is $2\frac{1}{2}$ ct.; $40 \div 2\frac{1}{2} = 16$, the number of yards.

52. If 4 of Moses's steps = 7 of Noah's, then one of Moses's = $1\frac{3}{4}$ of Noah's, and 5 of Moses's = $8\frac{3}{4}$ of Noah's; Moses gains $8\frac{3}{4} - 7 = 1\frac{3}{4}$ of Noah's steps every time he takes 5 steps; to gain 35 he must take 5 steps as many times as $1\frac{3}{4}$ are contained in 35. $35 = \frac{140}{4}$; $1\frac{3}{4} = \frac{7}{4}$; $\frac{140}{4} \div \frac{7}{4} = 20$; 20 times 5 steps = 100 steps.

53. One man will do as much work as 6 boys; 2 men as much as 12 boys; then 2 men would do in a week as much as 12 boys, and to do it in 1 day it would take 6 times 2 men = 12 men.

54. Let $\frac{1}{12}$ = the number in the first field; $\frac{4}{12}$, in the second; and $\frac{12}{12}$, in the third; then $\frac{12}{12} - \frac{1}{12} - \frac{4}{12} = \frac{7}{12}$, and $\frac{7}{12} = 70$; $\frac{1}{12} = 10$, the number in the first field; $\frac{4}{12} = 40$, the number in the second; $\frac{12}{12} = 120$, the number in the third.

55. For 24 days he would have received \$48. He loses \$2 each day he is idle, and pays 50 ct. for board = $\$2\frac{1}{2}$; $\$48 - \$38 = \$10$; $\$10 \div \$2\frac{1}{2} = 4$, number of days idle; 24 — 4 = 20, number of days he worked.

56. Since $\$12 = \frac{2}{7}$ of B's and C's, $\frac{7}{2} = \$42$; and $\$42 + \$12 = \$54$, what all had. If $\frac{3}{5}$ of C's = $\frac{3}{10}$ of A's and B's,

then $\frac{1}{8} = \frac{1}{10}$, and the whole of C's $= \frac{8}{10}$ of A's and B's; hence, $\frac{1}{10}$ of A's and B's $= \$54$; $\frac{1}{10} = \$3$, and $\frac{1}{10} = \$30$; $\$30 - \$12 = \$18$, B's share; $\$54 - \$30 = \$24$, C's share.

57. Six and six sevenths pounds cost $6\frac{6}{7}$ times 8 ct. $= 54\frac{6}{7}$ ct.; $\frac{1}{6}$ of $54\frac{6}{7}$ ct. $= 9\frac{1}{7}$ ct.; $54\frac{6}{7}$ ct. $+ 9\frac{1}{7}$ ct. $= 64$ ct.

58. The first has \$1200 for 1 mo.; the second has \$2400 for 1 mo., or \$1200 more than the first; the first must put in for the remaining 6 mo. $\frac{1}{6}$ of \$1200 $= \$200$.

59. The difference between selling at 9 ct. and 12 ct. is \$1.50 on the whole; on one pound the difference is 3 ct.; there are as many pounds as $\$1.50 \div 3 = 50$.

60. One of B's steps $= 1\frac{1}{2}$ of A's, and 4 of B's $= 6$ of A's; B gains $6 - 5 = 1$ step every time he takes 4 steps; B takes 4 steps 9 times in taking 36 steps. If he gains 1 step every time he takes 4, then A is 9 steps in advance of B.

61. Both had 9 oranges; each ate $\frac{1}{3}$ of 9 $= 3$. Thomas ate 2 of John's oranges, and should give him $\frac{2}{3}$ of 9 ct. $= 6$ ct.; he ate one of James's, and should give him $\frac{1}{3}$ of 9 ct. $= 3$ ct.



SOLUTIONS
TO
QUESTIONS AND PROBLEMS
IN
RAY'S NEW PRACTICAL ARITHMETIC.

NOTATION.

NUMBERS TO BE WRITTEN.

Art. 5.

- (1.) 23; 24; 25; 26; 27; 28; 29.
- (2.) 37; 42; 56; 69; 73; 87; 94.
- (3.) 83; 45; 99; 51; 36; 78; 62.
- (4.) 55; 93; 81; 67; 49; 74; 38.
- (5.) 76; 44; 82; 57; 35; 91; 63.

NUMBERS TO BE READ.

- (1.) Seventy-one; thirty-two; fifty-three; eighty-four; sixty-five; forty-six; ninety-seven.
- (2.) Fifty-eight; thirty-four; seventy-nine; sixty-six; forty-one; eighty-five; ninety-two.
- (3.) Seventy-five; forty-three; eighty-eight; sixty-one; fifty-nine; thirty-three; ninety-five.

(4.) Thirty-nine; seventy-two; fifty-four; eighty-six; forty-seven; ninety-eight; sixty-four.

(5.) Sixty-eight; seventy-seven; thirty-one; eighty-nine; fifty-two; ninety-six; forty-eight.

NUMBERS TO BE WRITTEN.

Art. 7.

(1.) 130; 140; 150; 160; 170; 180.

(2.) 123; 456; 789; 147; 258; 369.

(3.) 102; 345; 678; 234; 567; 890.

(4.) 453; 786; 912; 230; 450; 670.

(5.) 153; 486; 729; 103; 406; 709.

NUMBERS TO BE READ.

(1.) Two hundred and ten; three hundred and twenty; four hundred and thirty, etc.

(2.) Two hundred and thirteen; five hundred and forty-six; eight hundred and seventy-nine; four hundred and seventeen, etc.

(3.) Two hundred and one; four hundred and thirty-five; seven hundred and sixty-eight; three hundred and twenty-four, etc.

Art. 11.

(2.) 2000; 30000; 400000.

(3.) 5000000; 60000000;
700000000.

(4.) 8000000000; 90000-
000000; 100000000000.

(5.) 1200; 2100.

(6.) 3450; 6789.

(7.) 12345.

(8.) 678912.

(9.) 1357924.

(10.) 68143792.

(11.) 1001; 1010; 1100.

(12.) 1101; 1110; 1111.

(13.) 2003; 4050.

(14.) 45026.

(15.) 80201.

(16.) 90001.	(21.) 909090000.
(17.) 410205.	(22.) 700010002.
(18.) 100010.	(23.) 40000200005.
(19.) 3070509.	(24.) 726050001243.
(20.) 45083026.	(25.) 80703000504.

NUMERATION.

Art. 12.

(2.) Forty-one thousand five hundred and eighty-two; seven hundred and sixty-three thousand four hundred and ninety-one; two million five hundred and nineteen thousand eight hundred and thirty-four; three hundred and seventy-five million four hundred and eighty-six thousand nine hundred and twenty-one; four billion nine hundred and twenty-three million one hundred and seventy-six thousand three hundred and fifty-eight.

(3.) Thirty-seven billion five hundred and eighty-four million two hundred and sixteen thousand nine hundred and seventy-four; four hundred and thirty-two billion six hundred and eighty-five million seven hundred and twenty-nine thousand one hundred and forty-five; six trillion two hundred and fifty-three billion nine hundred and seventy-one million four hundred and thirty-eight thousand two hundred and sixty-seven.

(4.) One thousand three hundred; two thousand five hundred and forty; six thousand and seventy; eight thousand and nine; thirteen thousand two hundred; one thousand and five.

(5.) Six hundred and eighty-two thousand three hundred; eight million six hundred thousand and fifty; three thousand and forty; fifty thousand and four; seven hundred and four thousand two hundred and eight.

(6.) Seven thousand and eighty-five; sixty-two thou-

sand and one; four hundred thousand and nine; two million one hundred and two thousand one hundred and two; nine million one thousand and three.

(7.) One hundred and thirty million six hundred and seventy thousand nine hundred and twenty-one; six billion nine hundred million seven hundred and two thousand and three; twenty-three billion four million ninety thousand seven hundred and one; nine billion four hundred and twenty million one hundred and sixty-three thousand and seventy.

(8.) Five hundred and seventy trillion ten million three hundred and twenty-six thousand and forty-nine; two hundred quadrillion one hundred and three trillion four hundred and seventy-eight billion five hundred and eleven million nine hundred and ninety-two thousand four hundred and eighty-five.

(9.) Forty-five quintillion seven hundred and sixty-three quadrillion twenty billion one hundred and eight million five hundred and seven.

(10.) Eight hundred trillion eight hundred and twenty billion twenty million eight hundred and two thousand and eight.

Art. 13. (P. 21.)

(1.) I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV, XVI, XVII, XVIII, XIX, XX.

(2.) XXI, XXII, XXIII, XXIV, etc., XXX.

(3.) XXX, XL, L, LX, LXX, LXXX, XC.

(4.) LVII, XXIX, LXI, XXXVIII, XLVI, LXXII, XCIII.

(5.) C, CI, CVI, CXVII, CXXIX, CLXVIII.

(6.) CXCIX, CCXLVI, CCCIX, CCCCLXXXII, DXXVII, DCXCIII.

(7.) DCCXXXIV, DCCCLIX, DCCCCLXXV, MI, MX.

(8.) MXLVIII, MCXIX, MCCLXXXV, MCCCXXVI.

(9.) MCCCXCII, MDCCLXXVI, MDCCCLXI,
MDCCCC.

ADDITION.

Art. 17.

(2.)	\$210	(4.)	50230
	142		3105
	35		423
	<hr/>		<hr/>
	\$387		53758

Art. 19.

(8.) 21023. (9.) 27910. (10.) 89569.

(11.) 2499593. (12.) 24194086.

(29.) $146 + 607 + 47 = 800$: 1700 yr. + 800 yr. =
2500 yr.

(30)	(31)	(32)	(33)
3005	275432	880000889	8955752
42627	402030	2002002	6917246
105	300005	77436000	94523
307004	872026	206005207	<hr/>
80079	4002347	49003	15967521
320600	<hr/>	990019919	
753420	5851840	<hr/>	
		2155513020	

(34)	(35)	(36)	(37)	(38)
\$600	\$7850	\$8785	\$7000	30
1325	3275	12789	12875	30
30	3275	878	5600	25
120	2650	1250	4785	25
250	2650	<hr/>	3500	25
140	2650	\$23702	<hr/>	25
120	<hr/>		\$33760	20
115	\$22350			20
<hr/>				<hr/>
\$2700				200 yd.

SUBTRACTION.

Art. 26.

(5)	(6)	(8)	(9)
4444444	91516171	153425178	100000000
<u>1234567</u>	<u>15161718</u>	<u>53845248</u>	<u>10001001</u>
3209877	76354453	99579930	89998999

(14)	(15)	16)	(18)	(19)
\$1840	\$10104	\$100000	912010	4000000
<u>475</u>	<u>7426</u>	<u>11</u>	<u>50082</u>	<u>4004</u>
\$1365	\$2678	\$99989	861928	3995996

(20)	(21)	(22)	(23)
2020930	2000687	17102102	\$30000
<u>1009006</u>	<u>405022</u>	<u>13000201</u>	<u>26967</u>
1011924	1595665	4101901	\$3033

(24)	(25)
18126402	19900900900
<u>9238715</u>	<u>9909090009</u>
8887687	9991810891

ADDITION AND SUBTRACTION.

(1)	(2)	(3)	(4)
275	6723	\$2675	\$3000
381	<u>479</u>	<u>4375</u>	<u>4947</u>
<u>625</u>	6244	<u>1897</u>	<u>\$7947</u>
1281	<u>347</u>	\$8947	
1098	5897	<u>7947</u>	\$1300
<u>183</u>	<u>228</u>	\$1000, Ans.	<u>900</u>
	5669		\$400

(5)		(6)	(7)
\$450		\$350	\$4875
725		125	4875 }
1235		375	2250 }
4675	\$5935	150	3725
1727	877	<u>1000</u>	<u>\$15725</u>
<u>\$8812</u>	<u>\$6812</u>		
6812		\$2300	\$20838
<u>\$2000</u> , <i>Ans.</i>		<u>1000</u>	<u>15725</u>
		\$1300, <i>Ans.</i>	\$5113, <i>Ans.</i>

(8)		(9)	
\$16785	\$49570	\$7895	\$10093
24937	41722	175	8073
<u>\$41722</u>	<u>\$7848</u> , <i>Ans.</i>	<u>3</u>	<u>\$2020</u> , <i>Ans.</i>
		\$8073	

(10)		(11)		
\$5750	\$10000	\$4625	\$6955	\$9395
925	8925	3785	895	9225
1575	<u>\$1075</u> , <i>Ans.</i>	<u>985</u>	<u>1375</u>	<u>\$170</u> , <i>Ans.</i>
675		\$9395	\$9225	
<u>\$8925</u>				

(12)		
Received, \$50	Spent, \$25	\$100
50	7	91
<u>\$100</u>	2	<u>\$9</u> , <i>Ans.</i>
	5	
	35	
	7	
	2	
	8	
	<u>\$91</u>	

MULTIPLICATION.

Art. 31.

(25)	(26)	(27)	(28)	(29)
235	346	425	518	279
<u>13</u>	<u>19</u>	<u>29</u>	<u>34</u>	<u>37</u>
705	3114	3825	2072	1953
<u>235</u>	<u>346</u>	<u>850</u>	<u>1554</u>	<u>837</u>
3055	6574	12325	17612	10323

(30)	(31)	(32)	(33)	(34)
869	294	429	485	624
<u>49</u>	<u>57</u>	<u>62</u>	<u>76</u>	<u>85</u>
7821	2058	858	2910	3120
<u>3476</u>	<u>1470</u>	<u>2574</u>	<u>3395</u>	<u>4992</u>
42581	16758	26598	36860	53040

(35)	(36)	(37)	(38)
976	342	376	476
<u>97</u>	<u>364</u>	<u>526</u>	<u>536</u>
6832	1368	2256	2856
<u>8784</u>	<u>2052</u>	<u>752</u>	<u>1428</u>
94672	1026	1880	2380
	124488	197776	255136

(39)	(40)	(41)	(42)
2187	3489	1646	8432
<u>215</u>	<u>276</u>	<u>365</u>	<u>635</u>
10935	20934	8230	42160
<u>2187</u>	<u>24423</u>	<u>9876</u>	<u>25296</u>
4374	6978	4938	50592
470205	962964	600790	5354320

(43)	(44)	(45)	(46)
6874	2873	4786	87603
<u>829</u>	<u>1823</u>	<u>3497</u>	<u>9865</u>
61866	8619	33502	438015
13748	5746	43074	525618
<u>54992</u>	22984	19144	700824
5698546	<u>2873</u>	<u>14358</u>	<u>788427</u>
	5237479	16736642	864203595

(47)	(48)	(51)	(52)
83457	31624	675	496
<u>6835</u>	<u>7138</u>	<u>13</u>	<u>24</u>
417285	252992	2025	1984
250371	94872	<u>675</u>	<u>992</u>
667656	31624	8775 ct.	11904 ct.
<u>500742</u>	<u>221368</u>		
570428595	225732112		

(53)	(54)	(55)	(56)
152	1760	<u>24</u>	2029
<u>28</u>	<u>209</u>	<u>1460</u>	<u>1007</u>
1216	15840	730	14203
<u>304</u>	<u>3520</u>	<u>8760</u>	<u>2029</u>
4256 mi.	367840 yd.	8	2043203
		<u>70080 mi.</u>	

(57)	(58)	(60)	36
80401	101032	36	<u>55</u>
60007	20001	45	180
<u>562807</u>	<u>101032</u>	<u>180</u>	<u>180</u>
482406	202064	144	1980
<u>4824622807</u>	<u>2020741032</u>	<u>1620</u>	<u>1620</u>

Ans. 360 ct.

(61)

95 ct. — 2 ct. = 93 ct.

2650

93

7950

23850

246450 ct.

(62)

 $\$75 \times 6 = \450 $125 \times 5 = 625$ \$1075 $\$150 \times 11 = \1650 $\$1650 - \$1075 = \$575, \text{ Ans.}$

(63)

\$250

 $\$325 \times 2 = 650$ $175 \times 3 = 525$ \$1425

356

\$1781, Ans.

(64)

 $24 \times \$5 = \120 $36 \times 14 = 504$ $9 \times 45 = 405$ \$1029

275

\$754, Ans.

(65)

75 85

37 54

525 340

225 425

2775 4590

4590

7365

5284

2081, Ans.

(66)

69 48

53 27

207 336

345 96

3657 1296

3657

4953

4279

674, Ans.

(67)

63 lb.

50

3150 lb.

3150

34 ct.

12600

9450

107100 ct., Ans.

Art. 32.

(2)		(3)	(4)
\$124	\$124	1512 mi.	2873 lb.
<u>6</u>	<u>8</u>	<u>8</u>	<u>9</u>
\$744	or \$992	12096 mi.	25857 lb.
<u>4</u>	<u>3</u>	<u>7</u>	<u>6</u>
\$2976	\$2976	84672 mi.	155142 lb.

(5)	(6)
2874	8074
<u>9</u>	<u>12</u>
25866	96888
<u>8</u>	<u>9</u>
206928	871992

Art. 33.

(1)	(2)	(3)
245	138	428
<u>100</u>	<u>1000</u>	<u>10000</u>
24500	138000	4280000

(4)	(5)	(6)
872	9642	10045
<u>100000</u>	<u>1000000</u>	<u>10000000</u>
87200000	9642000000	10045000000

Art. 34.

(3)	(4)	(5)	(6)
2350	80300	10240	9600
<u>60</u>	<u>450</u>	<u>3200</u>	<u>2400</u>
141000	4015	2048	384
	<u>3212</u>	<u>3072</u>	<u>192</u>
	36135000	32768000	23040000

$$\begin{array}{r}
 (7) \\
 18001 \\
 \underline{26000} \\
 108006 \\
 36002 \\
 \hline
 468026000
 \end{array}$$

$$\begin{array}{r}
 (8) \\
 8602 \\
 \underline{1030} \\
 25806 \\
 8602 \\
 \hline
 8860060
 \end{array}$$

$$\begin{array}{r}
 (9) \\
 3007 \\
 \underline{9100} \\
 3007 \\
 \hline
 27063 \\
 \hline
 27363700
 \end{array}$$

$$\begin{array}{r}
 (10) \\
 80600 \\
 \underline{7002} \\
 1612 \\
 5642 \\
 \hline
 564361200
 \end{array}$$

$$\begin{array}{r}
 (11) \\
 70302 \\
 \underline{80300} \\
 210906 \\
 562416 \\
 \hline
 5645250600
 \end{array}$$

$$\begin{array}{r}
 (12) \\
 904000 \\
 \underline{10200} \\
 1808 \\
 904 \\
 \hline
 9220800000
 \end{array}$$

SHORT DIVISION.

Art. 41.

$$\begin{array}{r}
 (24) \\
 3 \overline{) 894} \\
 \underline{298}
 \end{array}$$

$$\begin{array}{r}
 (25) \\
 4 \overline{) 140} \\
 \underline{35}
 \end{array}$$

$$\begin{array}{r}
 (29) \\
 4 \overline{) 321276} \\
 \underline{80319}
 \end{array}$$

$$\begin{array}{r}
 (32) \\
 11 \overline{) 495} \\
 \underline{45}
 \end{array}$$

$$\begin{array}{r}
 (33) \\
 9 \overline{) 3582} \\
 \underline{398}
 \end{array}$$

$$\begin{array}{r}
 (46) \\
 4 \overline{) 144} \\
 \underline{3) 36} \\
 12 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (47) \\
 5 \overline{) 195} \quad 3 \overline{) 39} \\
 \underline{39} \quad \underline{13} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (48) \\
 8 \overline{) 192} \quad 11 \overline{) 275} \quad 25 \\
 \underline{24} \quad \underline{25} \quad \underline{24} \\
 1, \text{ Ans.}
 \end{array}$$

LONG DIVISION.

Art. 42.

$$\begin{array}{r} (5) \\ 14) 11577 \text{ (} 826\frac{13}{14}, \text{ Ans.} \end{array}$$

$$\begin{array}{r} 112 \\ \hline 37 \\ 28 \\ \hline 97 \\ 84 \\ \hline 13 \end{array}$$

$$\begin{array}{r} (6) \\ 15) 48690 \text{ (} 3246 \\ 45 \\ \hline 36 \\ 30 \\ \hline 69 \\ 60 \\ \hline 90 \\ 90 \\ \hline \end{array}$$

$$\begin{array}{r} (7) \\ 23) 1110960 \text{ (} 48302\frac{14}{23} \\ 92 \\ \hline 190 \\ 184 \\ \hline 69 \\ 69 \\ \hline 60 \\ 46 \\ \hline 14 \end{array}$$

$$\begin{array}{r} (8) \\ 67) 122878 \text{ (} 1834 \\ 67 \\ \hline 558 \\ 536 \\ \hline 227 \\ 201 \\ \hline 268 \\ 268 \\ \hline \end{array}$$

$$\begin{array}{r} (9) \\ 53) 12412 \text{ (} 234\frac{10}{53} \\ 106 \\ \hline 181 \\ 159 \\ \hline 222 \\ 212 \\ \hline 10 \end{array}$$

$$\begin{array}{r} (10) \\ 72) 146304 \text{ (} 2032 \\ 144 \\ \hline 230 \\ 216 \\ \hline 144 \\ 144 \\ \hline \end{array}$$

$$\begin{array}{r} (11) \\ 54) 47100 \text{ (} 872\frac{12}{54} \\ 432 \\ \hline 390 \\ 378 \\ \hline 120 \\ 108 \\ \hline 12 \end{array}$$

$$\begin{array}{r} (12) \\ 88) 71104 \text{ (} 808 \\ 704 \\ \hline 704 \\ 704 \\ \hline \end{array}$$

$$\begin{array}{r} (13) \\ 66) 43956 \text{ (} 666 \\ 396 \\ \hline 435 \\ 396 \\ \hline 396 \\ 396 \\ \hline \end{array}$$

Key 5.

<p>(14)</p> <p>99) 121900 (1231$\frac{31}{99}$</p> <p><u>99</u></p> <p>229</p> <p><u>198</u></p> <p>310</p> <p><u>297</u></p> <p>130</p> <p><u>99</u></p> <p>31</p>	<p>(15)</p> <p>112) 25312 (226</p> <p><u>224</u></p> <p>291</p> <p><u>224</u></p> <p>672</p> <p><u>672</u></p>	<p>(16)</p> <p>123) 381600 (3102$\frac{54}{123}$</p> <p><u>369</u></p> <p>126</p> <p><u>123</u></p> <p>300</p> <p><u>246</u></p> <p>54</p>
<p>(17)</p> <p>204) 105672 (518</p> <p><u>1020</u></p> <p>367</p> <p><u>204</u></p> <p>1632</p> <p><u>1632</u></p>	<p>(19)</p> <p>4321) 1234567 (285$\frac{3082}{4321}$</p> <p><u>8642</u></p> <p>37036</p> <p><u>34568</u></p> <p>24687</p> <p><u>21605</u></p> <p>3082</p>	<p>(18)</p> <p>1234) 600000 (486$\frac{276}{1234}$</p> <p><u>4936</u></p> <p>10640</p> <p><u>9872</u></p> <p>7680</p> <p><u>7404</u></p> <p>276</p>
<p>(20)</p> <p>7819) 50964242 (6518</p> <p><u>46914</u></p> <p>40502</p> <p><u>39095</u></p> <p>14074</p> <p><u>7819</u></p> <p>62552</p> <p><u>62552</u></p>	<p>(22)</p> <p>12345) 4049160 (328</p> <p><u>37035</u></p> <p>34566</p> <p><u>24690</u></p> <p>98760</p> <p><u>98760</u></p>	<p>(21)</p> <p>9876) 48905952 (4952</p> <p><u>39504</u></p> <p>94019</p> <p><u>88884</u></p> <p>51355</p> <p><u>49380</u></p> <p>19752</p> <p><u>19752</u></p>

$$\begin{array}{r}
 (23) \\
 973) 552160000 \text{ (567482 } \frac{14}{973}) \\
 \underline{4865} \\
 6566 \\
 \underline{5838} \\
 7280 \\
 \underline{6811} \\
 4690 \\
 \underline{3892} \\
 7980 \\
 \underline{7784} \\
 1960 \\
 \underline{1946} \\
 14
 \end{array}$$

$$\begin{array}{r}
 (25) \\
 26) 364 \text{ (14 days.} \\
 \underline{26} \\
 104 \\
 \underline{104}
 \end{array}$$

$$\begin{array}{r}
 (24) \\
 15) 3465 \text{ (231} \\
 \underline{30} \\
 46 \\
 \underline{45} \\
 15 \\
 \underline{15}
 \end{array}$$

$$\begin{array}{r}
 (26) \\
 19) 1083 \text{ (57 dollars,} \\
 \underline{95} \\
 133 \\
 \underline{133}
 \end{array}$$

$$\begin{array}{r}
 (27) \\
 107) 9523 \text{ (89 bu.} \\
 \underline{856} \\
 963 \\
 \underline{963}
 \end{array}$$

$$\begin{array}{r}
 (28) \\
 63) 14868 \text{ (236 hhd.} \\
 \underline{126} \\
 226 \\
 \underline{189} \\
 378 \\
 \underline{378}
 \end{array}$$

$$\begin{array}{r}
 (29) \\
 365) 50000 \text{ (136} \\
 \underline{365} \\
 1350 \\
 \underline{1095} \\
 2550 \\
 \underline{2190} \\
 360
 \end{array}$$

Ans. \$136 and \$360 over.

$$\begin{array}{r}
 (31) \\
 1235) 6571435 \text{ (5321} \\
 \underline{6175} \\
 3964 \\
 \underline{3705} \\
 2593 \\
 \underline{2470} \\
 1235 \\
 \underline{1235}
 \end{array}$$

$$\begin{array}{r}
 (30) \\
 365) 379600 \text{ ($1040} \\
 \underline{365} \\
 1460 \\
 \underline{1460} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (32) \\
 405) 1247400 \text{ (3080} \\
 \underline{1215} \\
 3240 \\
 \underline{3240} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (33) \\
 1006) 10401000 (10338 \frac{972}{1006} \\
 \underline{1006} \\
 3410 \\
 \underline{3018} \\
 3920 \\
 \underline{3018} \\
 9020 \\
 \underline{8048} \\
 972
 \end{array}$$

$$\begin{array}{r}
 (34) \\
 684) 109440 (160 \text{ A.} \\
 \underline{684} \\
 4104 \\
 \underline{4104} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (35) \\
 56) 8288 (148 \text{ A.} \\
 \underline{56} \\
 268 \\
 \underline{224} \\
 448 \\
 \underline{448}
 \end{array}$$

$$\begin{array}{r}
 (36) \\
 269) 262275 (975 \text{ dollars.} \\
 \underline{2421} \\
 2017 \\
 \underline{1883} \\
 1345 \\
 \underline{1345}
 \end{array}$$

$$\begin{array}{r}
 (37) \\
 24) 24899 (1037 \frac{11}{24} \text{ mi.} \\
 \underline{24} \\
 89 \\
 \underline{72} \\
 179 \\
 \underline{168} \\
 11
 \end{array}$$

$$\begin{array}{r}
 (38) \\
 238) 3731840 (15680 \\
 \text{dollars.} \\
 \underline{238} \\
 1351 \\
 \underline{1190} \\
 1618 \\
 \underline{1428} \\
 1904 \\
 \underline{1904} \\
 0
 \end{array}$$

$$\begin{array}{r}
 (39) \\
 24) 27048 (1127 \text{ ft.} \\
 \underline{24} \\
 30 \\
 \underline{24} \\
 64 \\
 \underline{48} \\
 168 \\
 \underline{168}
 \end{array}$$

$$\begin{array}{r}
 (40) \\
 92160000) 11520000 (8 \text{ min.} \\
 \underline{92160000}
 \end{array}$$

$$\begin{array}{r}
 (41) \\
 94231 \\
 \underline{86247} \\
 16) 7984 (499, \text{Ans.} \\
 \underline{64} \\
 158 \\
 \underline{144} \\
 144 \\
 \underline{144}
 \end{array}$$

$$\begin{array}{r}
 (42) \\
 46712 \\
 \underline{6848} \\
 104) 53560 \text{ (515)} \\
 \underline{520} \\
 156 \\
 \underline{104} \\
 520 \\
 \underline{520}
 \end{array}$$

$$\begin{array}{r}
 (43) \\
 497 \\
 \underline{583} \\
 1491 \\
 3976 \\
 \underline{2485} \\
 71) 289751 \text{ (4081)} \\
 \underline{284} \\
 575 \\
 \underline{568}
 \end{array}$$

$$\begin{array}{r}
 (44) \\
 2832 \\
 \underline{987} \\
 1845 \\
 \underline{678} \\
 87) 2523 \text{ (29)} \\
 \underline{174} \\
 783 \\
 \underline{783}
 \end{array}$$

$$\begin{array}{r}
 (45) \\
 4896 \\
 \underline{2384} \\
 2512 \\
 \underline{49} \\
 22608 \\
 \underline{10048} \\
 112) 123088 \text{ (1099)} \\
 \underline{112} \\
 1108 \\
 \underline{1008} \\
 1008 \\
 \underline{1008}
 \end{array}$$

$$\begin{array}{r}
 (46) \\
 228 \\
 \underline{786} \\
 1014 \\
 \underline{95} \\
 5070 \\
 \underline{9126} \\
 114) 96330 \text{ (845)} \\
 \underline{912} \\
 513 \\
 \underline{456}
 \end{array}$$

$$\begin{array}{r}
 (47) \\
 478 \quad 478 \\
 \underline{296} \quad \underline{296} \\
 182 \quad 774 \\
 \underline{182} \\
 1548 \\
 6192 \\
 \underline{774} \\
 387) 140868 \text{ (364)} \\
 \underline{1161} \\
 2476 \\
 \underline{2322} \\
 1548 \\
 \underline{1548}
 \end{array}$$

$$\begin{array}{r}
 (48) \\
 7560 \\
 \underline{3885} \\
 175) 3675 \text{ (21 horses)} \\
 \underline{350} \\
 175 \\
 \underline{175}
 \end{array}$$

(49)	(50)	(51)
7350	58	240
<u>4655</u>	<u>77</u>	<u>26</u>
49) 12005 (245 A.	406	1440
<u>98</u>	<u>406</u>	<u>480</u>
220	4466	6240
<u>196</u>		<u>2820</u>
245	5742	180) 3420 (19 horses.
<u>245</u>	<u>4466</u>	<u>180</u>
	58) 1276 (22 dollars	1620
	<u>116</u>	<u>1620</u>
	116	
	<u>116</u>	

	(52)	
125 lots.	25) 20625 (825 dolls., gain per acre.	
<u>250 dolls. each.</u>	<u>200</u>	
6250	62	125) 20625 (165 dolls., gain
<u>250</u>	<u>50</u>	<u>125</u> on each lot.
31250	125	812
<u>10625</u>	<u>125</u>	<u>750</u>
\$20625, whole gain.		625
		<u>625</u>

Art. 43.

(3)	(4)	(5)	(6)
9) 2583	4) 6976	4) 2744	6) 6145
<u>7) 287</u>	<u>8) 1744</u>	<u>7) 686</u>	<u>7) 1024</u> —1 rem.
Ans. 41	Ans. 218	Ans. 98	146—2
			$6 \times 2 + 1 = 13$ rem.
			Ans. $146\frac{13}{42}$

$$\begin{array}{r} (7) \\ 11 \overline{)19008} \\ 12 \overline{)1728} \\ \text{Ans. } 144 \end{array}$$

$$\begin{array}{r} (8) \\ 8 \overline{)7840} \text{ Ans.} \\ 8 \overline{)980} \quad 122\frac{3}{4} \\ 122-4 \\ 8 \times 4 = 32 \text{ rem.} \end{array}$$

$$\begin{array}{r} (9) \\ 8 \overline{)14771} \text{ Ans.} \\ 9 \overline{)1846-3} \quad 205\frac{1}{2} \\ 205-1 \\ 8 \times 1 + 3 = 11 \text{ rem.} \end{array}$$

$$\begin{array}{r} (10) \\ 9 \overline{)10206} \\ 9 \overline{)1134} \\ \text{Ans. } 126 \end{array}$$

$$\begin{array}{r} (11) \\ 11 \overline{)81344} \\ 11 \overline{)7394-10} \\ 672-2 \\ 2 \times 11 + 10 = 32 \\ \text{Ans. } 672\frac{3}{21} \end{array} \left. \vphantom{\begin{array}{r} 11 \overline{)81344} \\ 11 \overline{)7394-10} \\ 672-2 \\ 2 \times 11 + 10 = 32 \\ \text{Ans. } 672\frac{3}{21} \end{array}} \right\} \begin{array}{l} 121) 81344 (672\frac{3}{21} \\ 726 \\ 874 \\ 847 \\ 274 \\ 242 \\ 32 \end{array} \text{ or}$$

$$\begin{array}{r} (12) \\ 9 \overline{)98272} \\ 12 \overline{)10919-1} \\ 909-11 \\ 11 \times 9 + 1 = 100 \\ \text{Ans. } 909\frac{1}{8} \end{array} \left. \vphantom{\begin{array}{r} 9 \overline{)98272} \\ 12 \overline{)10919-1} \\ 909-11 \\ 11 \times 9 + 1 = 100 \\ \text{Ans. } 909\frac{1}{8} \end{array}} \right\} \begin{array}{l} 108) 98272 (909\frac{1}{8}, \text{ Ans.} \\ 972 \\ 1072 \\ 972 \\ 100 \end{array} \text{ or}$$

Art. 44.

$$\begin{array}{r} (2) \\ 1 \overline{)0} 268 \overline{)2} \\ 268\frac{2}{10} \end{array}$$

$$\begin{array}{r} (3) \\ 1 \overline{)00} 47 \overline{)00} \\ 47 \end{array}$$

$$\begin{array}{r} (4) \\ 1 \overline{)00} 372 \overline{)01} \\ 372\frac{1}{100} \end{array}$$

$$\begin{array}{r} (5) \\ 1 \overline{)00} 462 \overline{)50} \\ 462\frac{50}{100} \end{array}$$

$$\begin{array}{r} (6) \\ 1 \overline{)000} 18 \overline{)003} \\ 18\frac{3}{1000} \end{array}$$

Art. 45.

$$\begin{array}{r} (4) \\ 4 \overline{)000} 73 \overline{)005} \\ 18\frac{1005}{4000} \end{array}$$

$$\begin{array}{r} (5) \\ 9 \overline{)000} 36 \overline{)001} \\ 4\frac{1}{9000} \end{array}$$

$$\begin{array}{r} (6) \\ 11 \overline{)000} 1078 \overline{)000} \\ 98 \end{array}$$

$$\begin{array}{r} (7) \\ 18|0)4016|7(223\frac{27}{180} \end{array}$$

$$\begin{array}{r} 36 \\ \hline \end{array}$$

41

$$\begin{array}{r} 36 \\ \hline \end{array}$$

56

$$\begin{array}{r} 54 \\ \hline \end{array}$$

2

$$\begin{array}{r} (9) \\ 64|00)3640|06(56\frac{5606}{6400} \end{array}$$

$$\begin{array}{r} 320 \\ \hline \end{array}$$

440

$$\begin{array}{r} 384 \\ \hline \end{array}$$

56

$$\begin{array}{r} (8) \\ 21|00)9072|37(432\frac{37}{2100} \end{array}$$

$$\begin{array}{r} 84 \\ \hline \end{array}$$

67

$$\begin{array}{r} 63 \\ \hline \end{array}$$

42

$$\begin{array}{r} 42 \\ \hline \end{array}$$

$$\begin{array}{r} (10) \\ 25|0000)7654|6037(306\frac{46037}{250000} \end{array}$$

$$\begin{array}{r} 75 \\ \hline \end{array}$$

154

$$\begin{array}{r} 150 \\ \hline \end{array}$$

4

$$\begin{array}{r} (11) \\ 634|00)435637|54(687\frac{7954}{63400} \end{array}$$

$$\begin{array}{r} 3804 \\ \hline \end{array}$$

5523

$$\begin{array}{r} 5072 \\ \hline \end{array}$$

4517

$$\begin{array}{r} 4438 \\ \hline \end{array}$$

79

Art. 49.

$$\begin{array}{r} (1) \\ \$96 \quad \$500 \\ 120 \quad 271 \\ \hline 55 \quad \$229, \text{ Ans.} \\ \$271 \end{array}$$

$$\begin{array}{r} (2) \\ \$243 \text{ 1st.} \quad \$243 \quad \$1265 \\ 61 \quad 304 \quad 772 \\ \hline \$304 \text{ 2d.} \quad 225 \quad \$493, \text{ Ans.} \\ 79 \quad \$772 \\ \hline \$225 \text{ 3d.} \end{array}$$

$$\begin{array}{r} (3) \\ 157 \quad 428 \\ 264 \quad 186 \\ 305 \quad \hline 614 \\ 97 \\ \hline 123 \\ \hline 946 \\ 614 \\ \hline 332, \text{ Ans.} \end{array}$$

$$\begin{array}{r} (4) \\ 9503 \quad 57068 \\ 586 \quad 16967 \\ \hline 4794 \quad 40101, \text{ Ans.} \\ 1234 \\ \hline 850 \\ \hline 16967 \end{array}$$

	(5)	
\$12307	\$237	\$21013
8706	301	5918
<u>\$21013</u> , am't with gain.	<u>5380</u>	<u>\$15095</u> , <i>Ans.</i>
	\$5918, am't spent.	

(6)	(7)	(8)
86) 31173 ($362\frac{41}{86}$	28	63 gallons.
258	3 \$	5
<u>537</u>	<u>25</u> 1400 (56 dolls.	<u>15</u> 315 (21, <i>Ans.</i>
516	125	30
<u>213</u>	<u>150</u>	<u>15</u>
172	150	15
<u>41</u>		

(9)	(10)	
73900	148	148
70	56	56
<u>214</u> 73830 (345, <i>Ans.</i>	<u>92</u>	<u>204</u> , sum.
642		92, diff.
<u>963</u>		<u>408</u>
856		1836
<u>1070</u>		<u>23</u> 18768 (816, <i>Ans.</i>
1070		184
<u></u>		<u>36</u>
		23
		<u>138</u>
		138
	(11)	
\$60	\$45	
8	14	
<u>\$480</u>	<u>180</u>	
630	45	
<u>6</u> 1110	<u>\$630</u>	
185	<i>Ans.</i> , 185 yards.	

(12)

\$30	\$6000		156 acres.
70	2100	$3900 \div 25 = 156$	70 acres.
<u>\$2100</u>	<u>\$3900</u>		<u>226 acres, Ans.</u>

(13)

\$360		yr.
300	\$1800	800) 10400 (13, Ans.
150	1000	800
100	<u>\$800, saved each yr.</u>	<u>2400</u>
90		<u>2400</u>
<u>\$1000, spent each yr.</u>		

(14)

$40 \times \$15 = \600
$80 \times 25 = 2000$
Amt. pd., <u>\$2600</u>

	\$6300
$120 - 90 = 30$ acres.	<u>2600</u>
$30 \times 60 = 1800$	<u>\$3700, gain.</u>
$\$4500 + \$1800 = \$6300, 1st Ans.$	

(15)

$$275 \times \$4 = \$1100$$

$$250 \times \$5 = \$1250$$

$$25 \times 6 = \underline{150}$$

$$\underline{\$1400}$$

$$\underline{1100}$$

$$\underline{\$300, Ans.}$$

(17)

		(16)	
125	75	175)	19250 (110, Ans.
<u>\$85</u>	<u>\$115</u>	<u>175</u>	
625	375	175	
<u>1000</u>	<u>75</u>	<u>175</u>	
<u>\$10625</u>	<u>75</u>	<u>0</u>	
	<u>\$8625</u>		
	<u>10625</u>		
	<u>\$19250</u>		

\$150	\$125
<u>15</u>	<u>20</u>
750	<u>\$2500</u>
<u>150</u>	
<u>\$2250</u>	<u>\$45</u>
<u>2500</u>	<u>50</u>
<u>\$4750</u>	<u>\$2250</u>
<u>2250</u>	
<u>\$2500</u>	
<u>95</u>	
<u>\$2405, Ans.</u>	

COMPOUND NUMBERS.

U. S. MONEY.

EXAMPLES TO BE WRITTEN.

Art. 53.

(1.) \$12.178	(6.) \$ 20.022
(2.) \$ 6.066	(7.) \$100.10
(3.) \$ 7.007	(8.) \$200.02
(4.) \$40.535	(9.) \$400.018
(5.) \$ 2.03	

EXAMPLES TO BE READ.

Eighteen dollars sixty-two cents five mills; twenty dollars thirty-two cents four mills; seventy-nine dollars five cents; forty-six dollars; seventy dollars one cent five mills; one hundred dollars twenty-eight cents; etc.

Art. 55.

REDUCTION.

Since the operations in this section consist simply in adding ciphers or removing them, or erasing points or inserting them between the different denominations, it is deemed unnecessary to occupy space, as the whole solution, when presented to the eye, would consist in nothing more than writing down the question to be solved, and then placing the answer under it.

Art. 56.

ADDITION.

(2)	(3)	(4)
\$17.15	\$18.041	\$43.75
23.43	16.317	29.18
7.19	100.503	17.63
8.37	87.338	268.95
12.31	<u>\$222.199</u>	<u>718.07</u>
<u>\$68.45</u>		<u>\$1077.58</u>

(5)	(6)	(7)
\$200.00	\$504.06	\$5.070
43.87	420.19	30.203
56.93	105.50	100.005
8.50	304.00	60.020
2.31	888.47	700.011
<hr/> \$311.61	<hr/> \$2222.22	1000.100
		40.004
		<hr/> 64.587
		\$2000.000

Art. 57.

(2)	(3)	(4)	(5)
\$29.342	\$46.28	\$20.05	\$3.00
17.265	17.75	5.50	.03
<hr/> \$12.077	<hr/> \$28.53	<hr/> \$14.55	<hr/> \$2.97
(6)	(7)	(8)	(9)
\$10.000	\$50.000	\$1000.000	\$1000.43
.001	.505	1.011	900.68
<hr/> \$9.999	<hr/> \$49.495	<hr/> \$998.989	<hr/> \$99.75

MULTIPLICATION.

Art. 58.

(2)	(3)	(4)	
\$7.835	\$12.093	\$23.018	
8	9	16	
<hr/> \$62.680	<hr/> \$108.837	<hr/> 138108	
		23018	
		<hr/> \$368.288	
(5)	(6)		(7)
\$35.14	\$125.02		\$40.04
53	62		102
<hr/> 10542	<hr/> 25004		<hr/> 8008
17570	75012		4004
<hr/> \$1862.42	<hr/> \$7751.24		<hr/> \$4084.08

(8)	(9)	(10)	(11)
\$0.125	\$3.28	\$1.06	\$5.75
<u>17</u>	<u>38</u>	<u>338</u>	<u>38</u>
875	2624	848	4600
<u>125</u>	<u>984</u>	318	<u>1725</u>
\$2.125	\$124.64	<u>318</u>	\$218.50
		\$358.28	

(13)	(14)	(15)	(16)
\$0.34	\$5.67	\$2.69	\$1.25
<u>89</u>	<u>24</u>	<u>169</u>	<u>691</u>
306	2268	2421	125
<u>272</u>	<u>1134</u>	1614	<u>1125</u>
\$30.26	\$136.08	<u>269</u>	<u>750</u>
		\$454.61	\$863.75

(17)	(18)
73	281 lb.
<u>63 gal.</u>	<u>4</u>
219	1124 lb.
<u>438</u>	<u>\$0.065</u>
4599 gal.	5620
<u>\$0.55</u>	<u>6744</u>
22995	\$73.060
<u>22995</u>	
\$2529.45	

(19)	(20)	(21)
35	312	18
<u>10 yd.</u>	<u>11 hr.</u>	<u>3 bu.</u>
350 yd.	3432 hr.	54
\$0.01	<u>\$0.13</u>	<u>500</u>
\$3.50	10296	625
	<u>3432</u>	
	\$446.16, <i>Ans.</i>	<i>Ans.</i> \$67.50

$$\begin{array}{r}
 (22) \\
 \$10:001 \\
 150 \\
 \hline
 500050 \\
 10001 \\
 \hline
 \$1500.150
 \end{array}$$

$$\begin{array}{r}
 (23) \\
 17 \quad \$0.247 \\
 51 \text{ lb.} \quad 867 \\
 \hline
 17 \quad 1729 \\
 85 \quad 1482 \\
 \hline
 867 \text{ lb.} \quad 1976 \\
 \hline
 \$214.149, \text{ Ans.}
 \end{array}$$

DIVISION.

Art. 59.

CASE I.

$$\begin{array}{r}
 (2) \quad (3) \quad (4) \quad (5) \\
 9)72 \quad 375)6000(16 \quad 8)280 \quad 25)300(12 \text{ yd.} \\
 \hline
 8 \text{ lb.} \quad 375 \quad 35 \text{ yd.} \quad 25 \\
 \hline
 2250 \quad 50 \\
 2250 \quad 50 \\
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 (6) \quad (7) \quad (8) \\
 805)16100(20 \text{ bbl.} \quad 75)1200(16 \quad 1125)234000(208 \text{ bu.} \\
 \hline
 1610 \quad 75 \quad 2250 \\
 \hline
 0 \quad 450 \quad 9000 \\
 \hline
 \quad 450 \quad 9000 \\
 \hline
 \hline
 \end{array}$$

CASE II.

$$\begin{array}{r}
 (3) \quad (4) \quad (5) \\
 8)\$65.000 \quad 23)\$29.610(\$1.287+ \quad 4)\$92.250 \\
 \hline
 \$8.125 \quad 23 \quad \$23.062+ \\
 \hline
 66 \quad 46 \\
 \hline
 201 \quad 201 \\
 184 \quad 184 \\
 \hline
 170 \quad 170 \\
 161 \quad 161 \\
 \hline
 9 \quad 9
 \end{array}$$

$$\begin{array}{r} (7) \\ 16)\$25.76(\$1.61 \end{array}$$

$$\begin{array}{r} 16 \\ \hline 97 \\ 96 \\ \hline 16 \\ 16 \\ \hline \end{array}$$

$$\begin{array}{r} (8) \\ 755)\$328.425(\$0.435 \\ \hline 3020 \\ \hline 2642 \\ 2265 \\ \hline 3775 \\ 3775 \\ \hline \end{array}$$

$$\begin{array}{r} (9) \\ 313)\$800.000(\$2.555+ \end{array}$$

$$\begin{array}{r} 626 \\ \hline 1740 \\ 1565 \\ \hline 1750 \\ 1565 \\ \hline 1850 \\ 1565 \\ \hline 285 \end{array}$$

$$\begin{array}{r} (10) \\ 133)\$10000.000(\$75.187+ \end{array}$$

$$\begin{array}{r} 931 \\ \hline 690 \\ 665 \\ \hline 250 \\ 133 \\ \hline 1170 \\ 1064 \\ \hline 1060 \\ 931 \\ \hline 129 \end{array}$$

$$\begin{array}{r} (11) \\ 154)\$2705.010(\$17.565 \end{array}$$

$$\begin{array}{r} 154 \\ \hline 1165 \\ 1078 \\ \hline 870 \\ 770 \\ \hline 1001 \\ 924 \\ \hline 770 \\ 770 \\ \hline \end{array}$$

$$\begin{array}{r} (12) \\ 25 \\ 15 \text{ lb.} \\ \hline 125 \\ 25 \\ \hline \text{lb. } 375)\$60.00(\$0.16 \\ \hline 375 \\ \hline 2250 \\ 2250 \\ \hline \end{array}$$

$$\begin{array}{r} (13) \\ 235 \text{ lb.} \\ 8 \\ \hline \text{lb. } 1880)\$122.200(\$0.065 \\ \hline 11280 \\ \hline 9400 \\ 9400 \\ \hline \end{array}$$

Art. 60.

(1)	(2)	(3)	(4)
\$47.50	\$35.25	\$18.38	\$0.75 \$5.00
38.45	23.75	81.62	.35 3.10
15.47	\$59.00	\$100.00	.50 \$1.90, <i>Ans.</i>
19.43	59.00	200.00	1.50
<u>\$120.85</u>	<u>1.00</u>	<u>\$300.00</u>	<u>\$3.10</u>
	\$119.00		

(5)	(6)
\$8.10	\$50.00
5.65	30.50
\$0.25 \times 8 = 2.00	<u>\$19.50</u>
4.00	6
<u>\$19.75</u>	<u>\$117.00</u>

(7)	(8)	(9)	(10)
\$3.85	\$37.06	143	435
1.25	200.85	23 ct.	45 ct.
2.50	400.00	<u>429</u>	<u>2175</u>
1.50	236.75	286	1740
<u>\$9.10</u>	<u>124.34</u>	<u>\$32.89</u>	<u>\$195.75</u>
	\$999.00	12.60	
\$21.75	889.25	<u>\$20.29</u>	\$400.00
9.10	\$109.75		195.75
<u>\$12.65, <i>Ans.</i></u>			<u><i>Ans.</i> \$204.25</u>

(11)	(12)
365	21 63
65 ct.	3 bu. 35 ct.
<u>1825</u>	<u>63 bu. 315</u>
2190	189
<u>\$237.25</u>	<u><i>Ans.</i> \$22.05</u>

(13)		(14)	
19 yd. 76		\$2000.00	5)\$1836.25
<u>4</u> <u>23</u> ct.		<u>163.75</u>	5)\$367.25
76 yd. 228		\$1836.25	<u>\$73.45, Ans.</u>
152			
<u>\$17.48, Ans.</u>			

(15)	(16)	(17)	
4)\$516.00	40)\$910.00	22 = 2 × 11	
<u>4)\$129.00</u>	<u>10)\$2.25</u>	\$1000.00	
43)\$32.25 (\$0.75, Ans.)	\$0.225, Ans.	<u>500.00</u>	
301		2)\$1500.00	
<u>215</u>		11)\$750.00	
215		<u>Ans. \$68.18+</u>	

MERCHANTS' BILLS.

(18.)	9 lb. @	\$0.32 =	\$2.88		
	4 " "	1.25 =	5.00		
	45 " "	.09 =	4.05		
	17 " "	.20 =	3.40		
			<u>15.33</u>		<u>\$15.33</u>

(19.)	22 yd. @	\$1.75 =	\$38.50		
	18 " "	.15 =	2.70		
	25 " "	.65 =	16.25		
	6 " "	.18 =	1.08		
			<u>58.53</u>		<u>\$58.53</u>

(20.)	4 lb. @	\$0.18 =	\$0.72		
	8 " "	.23 =	1.84		
	7 " "	.11 =	.77		
	6 " "	.09 =	.54		
	13 " "	.35 =	4.55		
	26 " "	.12 =	3.12		
			<u>11.54</u>		<u>\$11.54</u>

Key 6.

(21.)	43 yd. @	\$0.13 = \$5.59	
-	28 " "	.09 = 2.52	
	23 " "	.23 = <u>5.29</u>	<u>\$13.40</u>

DRY MEASURE.

Art. 63.

(5.) 4 bu. $\times 4 + 2$ pk. = 18 pk.: 18 pk. $\times 8 + 1$ qt. = 145 qt.: 145 qt. $\times 2 = 290$ pt., *Ans.*

(6.) 7 bu. $\times 4 + 3$ pk. = 31 pk.: 31 pk. $\times 8 + 7$ qt. = 255 qt.: 255 qt. $\times 2 + 1$ pt. = 511 pt., *Ans.*

(7.) 3 bu. $\times 4 = 12$ pk.: 12 pk. $\times 8 = 96$ qt.: 96 qt. $\times 2 + 1$ pt. = 193 pt., *Ans.*

(8.) 384 pt. $\div 2 = 192$ qt.: 192 qt. $\div 8 = 24$ pk.: 24 pk. $\div 4 = 6$ bu., *Ans.*

(9.) 47 pt. $\div 2 = 23$ qt. 1 pt.: 23 qt. $\div 8 = 2$ pk. 7 qt. *Ans.* 2 pk. 7 qt. 1 pt.

(10.) 95 pt. $\div 2 = 47$ qt. 1 pt.: 47 qt. $\div 8 = 5$ pk. 7 qt.: 5 pk. $\div 4 = 1$ bu. 1 pk. Collecting the different remainders, the *Ans.* is 1 bu. 1 pk. 7 qt. 1 pt.

(11.) 508 pt. $\div 2 = 254$ qt.: 254 qt. $\div 8 = 31$ pk. 6 qt.: 31 pk. $\div 4 = 7$ bu. 3 pk. *Ans.* 7 bu. 3 pk. 6 qt.

LIQUID MEASURE.

Art. 64.

(1.) 17 gal. $\times 4 \times 2 = 136$ pt., *Ans.*

(2.) 13 gal. $\times 4 \times 2 \times 4 = 416$ gi., *Ans.*

(3.) 126 gal. $\times 4 \times 2 = 1008$ pt., *Ans.*

(4.) 1260 gal. $\times 4 \times 2 \times 4 = 40320$ gi., *Ans.*

(5.) 1120 gi. $\div 4 = 280$, $\div 2 = 140$, $\div 4 = 35$ gal., *Ans.*

$$(6.) 1848 \text{ cu. in.} \div 231 = 8 \text{ gal., } Ans.$$

$$(7.) 138138 \text{ cu. in.} \div 231 = 598 \text{ gal., } Ans.$$

AVOIRDUPOIS WEIGHT.

Art. 65.

$$(1.) 2 \text{ cwt.} \times 4 \times 25 = 200 \text{ lb., } Ans.$$

$$(2.) 3 \text{ cwt.} \times 100 = 300 \text{ lb.} + 75 \text{ lb.} = 375 \text{ lb., } Ans.$$

$$(3.) 1 \text{ T.} \times 20 + 2 \text{ cwt.} = 22 \text{ cwt.} \times 100 = 2200 \text{ lb., } Ans.$$

$$(4.) 3 \text{ T.} \times 20 \times 100 = 6000 \text{ lb.} + 75 \text{ lb.} = 6075 \text{ lb., } Ans.$$

$$(5.) 4 \text{ cwt.} \times 100 + 44 \text{ lb.} = 444 \text{ lb., } Ans.$$

$$(6.) 5 \text{ T.} \times 20 \times 100 + 90 \text{ lb.} = 10090 \text{ lb., } Ans.$$

$$(7.) 2 \text{ cwt.} \times 100 + 77 \text{ lb.} = 277 \text{ lb.} : 277 \text{ lb.} \times 16 + 12 \text{ oz.} = 4444 \text{ oz., } Ans.$$

$$(8.) 2 \text{ cwt.} \times 100 + 17 \text{ lb.} = 217 \text{ lb.} : 217 \text{ lb.} \times 16 + 3 \text{ oz.} = 3475 \text{ oz., } Ans.$$

$$(9.) 1 \text{ T.} \times 20 + 6 \text{ cwt.} = 26 \text{ cwt.,} \times 100 + 4 \text{ lb.} = 2604 \text{ lb.,} \times 16 + 2 \text{ oz.} = 41666 \text{ oz., } Ans.$$

$$(10.) 4803 \text{ lb.} \div 100 = 48 \text{ cwt. and } 3 \text{ lb. over, } Ans.$$

$$(11.) 22400 \text{ lb.} \div 100 \div 20 = 11 \text{ T. and } 4 \text{ cwt., } Ans.$$

$$(12.) 2048000 \div 16 = 128000 \text{ lb.,} \div 100 = 1280 \text{ cwt.,} \div 20 = 64 \text{ T., } Ans.$$

$$(13.) 64546 \text{ oz.} \div 16 = 4034 \text{ lb. } 2 \text{ oz.} : 4034 \div 100 = 40 \text{ cwt. } 34 \text{ lb. } Ans. 40 \text{ cwt. } 34 \text{ lb. } 2 \text{ oz.}$$

$$(14.) 97203 \text{ oz.} \div 16 = 6075 \text{ lb. } 3 \text{ oz.} : 6075 \div 100 = 60 \text{ cwt. } 75 \text{ lb.} : 60 \div 20 = 3 \text{ T. } Ans. 3 \text{ T. } 75 \text{ lb. } 3 \text{ oz.}$$

$$(15.) 544272 \text{ oz.} \div 16 = 34017 \text{ lb.,} \div 100 = 340 \text{ cwt. } 17 \text{ lb.} : 340 \div 20 = 17 \text{ T. } Ans. 17 \text{ T. } 17 \text{ lb.}$$

$$(16.) 52 \times 18 = 936 \text{ lb.} : 936 \div 100 = 9 \text{ cwt. } 36 \text{ lb., } Ans.$$

$$(17.) 180 \times 75 = 13500 \text{ lb.} : 13500 \div 100 = 135 \text{ cwt. } \div 20 = 6 \text{ T. } 15 \text{ cwt., } Ans.$$

LONG MEASURE.

Art. 66.

$$(1.) 2 \text{ yd.} \times 3 + 2 \text{ ft.} = 8 \text{ ft.} : 8 \text{ ft.} \times 12 + 7 \text{ in.} = 103 \text{ in., } Ans.$$

$$(2.) 7 \text{ yd.} \times 3 = 21 \text{ ft.,} \times 12 + 11 \text{ in.} = 263 \text{ in., } Ans.$$

$$(3.) 12 \text{ mi.} \times 320 = 3840 \text{ rd., } Ans.$$

$$(4.) 7 \text{ mi.} \times 320 + 240 \text{ rd.} = 2480 \text{ rd., } Ans$$

$$(5.) 9 \text{ mi.} \times 320 + 31 \text{ rd.} = 2911 \text{ rd., } Ans$$

$$(6.) 133 \text{ in.} \div 12 = 11 \text{ ft. } 1 \text{ in.} : 11 \text{ ft.} \div 3 = 3 \text{ yd. } 2 \text{ ft.} \\ Ans. 3 \text{ yd. } 2 \text{ ft. } 1 \text{ in.}$$

$$(7.) 181 \text{ in.} \div 12 = 15 \text{ ft. } 1 \text{ in.} : 15 \text{ ft.} \div 3 = 5 \text{ yd. } Ans. \\ 5 \text{ yd. } 1 \text{ in.}$$

$$(8.) 2240 \text{ rd.} \div 320 = 7 \text{ mi., } Ans.$$

$$(9.) 2200 \text{ rd.} \div 320 = 6 \text{ mi. } 280 \text{ rd., } Ans.$$

$$(10.) 1 \text{ mi.} \times 320 \times 5\frac{1}{2} = 1760 \text{ yd., } Ans.$$

$$(11.) 1 \text{ mi.} \times 320 \times 5\frac{1}{2} \times 3 = 5280 \text{ ft. } Ans.$$

SQUARE MEASURE.

Art. 67.

$$(1.) 8 \text{ sq. yd.} \times 9 \times 144 = 10368 \text{ sq. in., } Ans.$$

$$(2.) 4 \text{ A.} \times 160 = 640 \text{ sq. rd., } Ans.$$

$$(3.) 1 \text{ sq. mi.} \times 640 \times 160 = 102400 \text{ sq. rd., } Ans.$$

$$(4.) 2 \text{ sq. yd.} \times 9 + 3 \text{ sq. ft.} = 21 \text{ sq. ft.} : 21 \text{ sq. ft.} \times 144 \\ = 3024 \text{ sq. in., } Ans.$$

$$(5.) 5 \text{ A.} \times 160 + 100 \text{ sq. rd.} = 900 \text{ sq. rd., } Ans.$$

$$(6.) 960 \text{ sq. rd.} \div 160 = 6 \text{ A., } Ans.$$

$$(7.) 3888 \text{ sq. in.} \div 144 = 27 \text{ sq. ft.: } 27 \text{ sq. ft.} \div 9 = 3 \text{ sq. yd., } Ans.$$

$$(8.) 20000 \text{ sq. rd.} \div 160 = 125 \text{ A., } Ans.$$

$$(9.) 515280 \text{ sq. rd.} \div 160 \div 640 = 5 \text{ sq. mi. } 20 \text{ A. } 80 \text{ sq. rd., } Ans.$$

$$(10.) 4176 \text{ sq. in.} \div 144 = 29 \text{ sq. ft.: } 29 \text{ sq. ft.} \div 9 = 3 \text{ sq. yd. } 2 \text{ sq. ft., } Ans.$$

Art. 68.

$$(2.) 16 \text{ ft.} \times 12 \text{ ft.} = 192 \text{ sq. ft., } Ans.$$

$$(3.) 5 \text{ yd.} \times 4 \text{ yd.} = 20 \text{ sq. yd., } Ans.$$

$$(4.) 18 \text{ ft.} \div 3 = 6 \text{ yd.: } 12 \text{ ft.} \div 3 = 4 \text{ yd.: } 21 \text{ ft.} \div 3 = 7 \text{ yd.: } 15 \text{ ft.} \div 3 = 5 \text{ yd. } 6 \text{ yd.} \times 4 \text{ yd.} = 24 \text{ sq. yd.: } 7 \text{ yd.} \times 5 \text{ yd.} = 35 \text{ sq. yd.: } 24 \text{ sq. yd.} + 35 \text{ sq. yd.} = 59 \text{ sq. yd., } Ans.$$

$$(5.) 18 \text{ ft.} \times 14 \text{ ft.} = 252 \text{ sq. ft.: } 252 \text{ sq. ft.} \div 9 = 28 \text{ sq. yd., } Ans.$$

$$(6.) 35 \text{ rd.} \times 32 \text{ rd.} = 1120 \text{ sq. rd.: } 1120 \text{ sq. rd.} \div 160 = 7 \text{ A., } Ans.$$

$$(7.) 18 \text{ ft.} \div 3 = 6 \text{ yd.: } 15 \text{ ft.} \div 3 = 5 \text{ yd. } 5 \text{ yd.} \times 6 \text{ yd.} \times 2 = 60 \text{ sq. yd.: } 60 \times \$1.25 = \$75, \text{ } Ans.$$

$$(8.) 21 \text{ ft.} = 7 \text{ yd.: } 18 \text{ ft.} = 6 \text{ yd.; } 7 \text{ yd.} \times 6 \text{ yd.} = 42 \text{ sq. yd.: } 42 \times \$0.17 = \$7.14, \text{ } Ans.$$

Art. 69.

$$(1.) 132 \text{ sq. ft.} \div 11 \text{ ft.} = 12 \text{ ft., } Ans.$$

$$(2.) 30 \text{ sq. yd.} \times 9 = 270 \text{ sq. ft.: } 270 \text{ sq. ft.} \div 18 \text{ ft.} = 15 \text{ ft., } Ans.$$

(3.) $9 \text{ A.} \times 160 = 1440 \text{ sq. rd.}$: $1440 \text{ sq. rd.} \div 45 \text{ rd.} = 32 \text{ rd.}$, *Ans.*

(4.) $21 \text{ A.} \times 160 = 3360 \text{ sq. rd.}$: $3360 \text{ sq. rd.} \div 35 \text{ rd.} = 96 \text{ rd.}$, *Ans.*

CUBIC MEASURE.

Art. 70.

(1.) $2 \text{ cu. yd.} \times 27 \times 1728 = 93312 \text{ cu. in.}$, *Ans.*

(2.) $28 \text{ C.} \times 128 = 3584 \text{ cu. ft.}$, *Ans.*

(3.) $34 \text{ C.} \times 128 \times 1728 = 7520256 \text{ cu. in.}$, *Ans.*

(4.) $1 \text{ C.} \times 128 \times 1728 = 221184 \text{ cu. in.}$, *Ans.*

(5.) $63936 \text{ cu. in.} \div 1728 = 37 \text{ cu. ft.}$: $37 \text{ cu. ft.} \div 27 = 1 \text{ cu. yd.}$ 10 cu. ft. , *Ans.*

(6.) $8 \text{ ft.} \times 5 \text{ ft.} \times 4 \text{ ft.} = 160 \text{ cu. ft.}$, *Ans.*

(7.) $8 \text{ yd.} \times 5 \text{ yd.} \times 2 \text{ yd.} = 80 \text{ cu. yd.}$, *Ans.*

(8.) $18 \text{ ft.} \times 15 \text{ ft.} \times 7 \text{ ft.} = 1890 \text{ cu. ft.}$: $1890 \text{ cu. ft.} \div 27 = 70 \text{ cu. yd.}$, *Ans.*

(9.) $40 \text{ ft.} \times 12 \text{ ft.} \times 8 \text{ ft.} = 3840 \text{ cu. ft.}$: $3840 \text{ cu. ft.} \div 128 = 30 \text{ C.}$, *Ans.*

(10.) $80 \text{ ft.} \times 8 \text{ ft.} \times 4 \text{ ft.} = 2560 \text{ cu. ft.}$: $2560 \text{ cu. ft.} \div 128 = 20 \text{ C.}$: $20 \times \$5.50 = \110 , *Ans.*

(11.) $24 \text{ ft.} = 8 \text{ yd.}$, $15 \text{ ft.} = 5 \text{ yd.}$, $6 \text{ ft.} = 2 \text{ yd.}$: $8 \text{ yd.} \times 5 \text{ yd.} \times 2 \text{ yd.} = 80 \text{ cu. yd.}$: $80 \times \$1.25 = \100 , *Ans.*

TIME MEASURE.

Art. 71.

(1.) $2 \text{ hr.} \times 60 \times 60 = 7200 \text{ sec.}$, *Ans.*

(2.) $7 \text{ da.} \times 24 \times 60 = 10080 \text{ min.}$, *Ans.*

(3.) $1 \text{ da.} \times 24 + 3 \text{ hr.} = 27 \text{ hr.}$: $27 \text{ hr.} \times 60 + 44 \text{ min.} = 1664 \text{ min.}$: $1664 \text{ min.} \times 60 + 3 \text{ sec.} = 99843 \text{ sec.}$, *Ans.*

(4.) $9 \text{ wk.} \times 7 + 6 \text{ da.} = 69 \text{ da.}$; $69 \text{ da.} \times 24 + 10 \text{ hr.} = 1666 \text{ hr.}$; $1666 \text{ hr.} \times 60 + 40 \text{ min.} = 100000 \text{ min.}$, *Ans.*

(5.) $4 \text{ wk.} \times 7 + 3 \text{ da.} = 31 \text{ da.}$; $31 \text{ da.} \times 24 = 744 \text{ hr.}$; $744 \text{ hr.} \times 60 + 4 \text{ min.} = 44644 \text{ min.}$, *Ans.*

(6.) $10800 \text{ sec.} \div 60 = 180 \text{ min.}$; $180 \text{ min.} \div 60 = 3 \text{ hr.}$, *Ans.*

(7.) $432000 \text{ sec.} \div 60 = 7200 \text{ min.}$; $7200 \text{ min.} \div 60 = 120 \text{ hr.}$; $120 \text{ hr.} \div 24 = 5 \text{ da.}$, *Ans.*

(8.) $7322 \text{ sec.} \div 60 = 122 \text{ min.}$ 2 sec.; $122 \text{ min.} \div 60 = 2 \text{ hr.}$ 2 min. *Ans.* 2 hr. 2 min. 2 sec.

(9.) $4323 \text{ min.} \div 60 = 72 \text{ hr.}$ 3 min.; $72 \text{ hr.} \div 24 = 3 \text{ da.}$ *Ans.* 3 da. 3 min.

(10.) $20280 \text{ min.} \div 60 = 338 \text{ hr.}$; $338 \text{ hr.} \div 24 = 14 \text{ da.}$ 2 hr.; $14 \text{ da.} \div 7 = 2 \text{ wk.}$ *Ans.* 2 wk. 2 hr.

(11.) $41761 \text{ min.} \div 60 = 696 \text{ hr.}$ 1 min.; $696 \text{ hr.} \div 24 = 29 \text{ da.}$; $29 \text{ da.} \div 7 = 4 \text{ wk.}$ 1 da.; $4 \text{ wk.} \div 4 = 1 \text{ mo.}$ *Ans.* 1 mo. 1 da. 1 min.

MISCELLANEOUS TABLES.

Art. 73.

(1.) $5 \text{ lb.} \times 12 + 4 \text{ oz.} = 64 \text{ oz.}$, *Ans.*

(2.) $9 \text{ lb.} \times 12 + 3 \text{ oz.} = 111 \text{ oz.}$; $111 \text{ oz.} \times 20 + 5 \text{ pwt.} = 2225 \text{ pwt.}$, *Ans.*

(3.) $8 \text{ lb.} \times 12 + 9 \text{ oz.} = 105 \text{ oz.}$; $105 \text{ oz.} \times 20 + 13 \text{ pwt.} = 2113 \text{ pwt.}$; $2113 \text{ pwt.} \times 24 + 17 \text{ gr.} = 50729 \text{ gr.}$, *Ans.*

(4.) $805 \text{ pwt.} \div 20 = 40 \text{ oz.}$ 5 pwt.; $40 \text{ oz.} \div 12 = 3 \text{ lb.}$ 4 oz. *Ans.* 3 lb. 4 oz. 5 pwt.

(5.) $12530 \text{ gr.} \div 24 = 522 \text{ pwt.}$ 2 gr.; $522 \text{ pwt.} \div 20 = 26 \text{ oz.}$ 2 pwt.; $26 \text{ oz.} \div 12 = 2 \text{ lb.}$ 2 oz. *Ans.* 2 lb. 2 oz. 2 pwt. 2 gr.

$$(6.) 4 \text{ lb.} \times 12 + 5 \text{ } \frac{3}{4} = 53 \text{ } \frac{3}{4} : 53 \times 8 \times 3 \times 20 + 2 \text{ gr.} \\ = 25442 \text{ gr., Ans.}$$

$$(7.) 7 \text{ lb.} \times 12 + 2 \text{ } \frac{3}{4} = 86 \text{ } \frac{3}{4} : 86 \text{ } \frac{3}{4} \times 8 = 688 \text{ } \frac{3}{4} : 688 \text{ } \frac{3}{4} \\ \times 3 + 1 \text{ } \frac{1}{2} = 2065 \text{ } \frac{1}{2} : 2065 \text{ } \frac{1}{2} \times 20 = 41300 \text{ gr., Ans.}$$

$$(8.) 431 \text{ } \frac{3}{4} \div 8 = 53 \text{ } \frac{3}{4} 7 \text{ } \frac{3}{4} : 53 \text{ } \frac{3}{4} \div 12 = 4 \text{ lb. } 5 \text{ } \frac{3}{4}. \text{ Ans.} \\ 4 \text{ lb. } 5 \text{ } \frac{3}{4} 7 \text{ } \frac{3}{4}.$$

$$(9.) 975 \text{ } \frac{1}{2} \div 3 = 325 \text{ } \frac{1}{2} : 325 \text{ } \frac{1}{2} \div 8 = 40 \text{ } \frac{3}{4} 5 \text{ } \frac{1}{2} : 40 \text{ } \frac{3}{4} \div \\ 12 = 3 \text{ lb. } 4 \text{ } \frac{3}{4}. \text{ Ans. } 3 \text{ lb. } 4 \text{ } \frac{3}{4} 5 \text{ } \frac{1}{2}.$$

$$(10.) 6321 \text{ gr.} \div 20 = 316 \text{ } \frac{1}{2} 1 \text{ gr.} : 316 \text{ } \frac{1}{2} \div 3 = 105 \text{ } \frac{1}{2} \\ 1 \text{ } \frac{1}{2} : 105 \text{ } \frac{1}{2} \div 8 = 13 \text{ } \frac{3}{4} 1 \text{ } \frac{1}{2} : 13 \text{ } \frac{3}{4} \div 12 = 1 \text{ lb. } 1 \text{ } \frac{3}{4}. \text{ Ans.} \\ 1 \text{ lb. } 1 \text{ } \frac{3}{4} 1 \text{ } \frac{1}{2} 1 \text{ } \frac{1}{2} 1 \text{ gr.}$$

$$(11.) 4 \text{ cong.} \times 8 \times 16 + 7 \text{ f. } \frac{3}{4} \times 8 = 4152 \text{ f. } \frac{3}{4}, \text{ Ans.}$$

$$(12.) 5 \text{ O.} \times 16 + 6 \text{ f. } \frac{3}{4} = 86 \text{ f. } \frac{3}{4} : 86 \text{ f. } \frac{3}{4} \times 8 + 3 \text{ f. } \frac{3}{4} = \\ 691 \text{ f. } \frac{3}{4} : 691 \times 60 = 41460 \text{ minims, Ans.}$$

$$(13.) 2469 \text{ f. } \frac{3}{4} \div 8 = 308 \text{ f. } \frac{3}{4} 5 \text{ f. } \frac{3}{4} : 308 \div 16 = 19 \text{ O.} \\ 4 \text{ f. } \frac{3}{4} : 19 \div 8 = 2 \text{ cong. } 3 \text{ O. } \text{ Ans. } 2 \text{ cong. } 3 \text{ O. } 4 \text{ f. } \frac{3}{4} 5 \text{ f. } \frac{3}{4}.$$

$$(14.) 3 \text{ yd.} \times 3 = 9 \text{ ft.,} \times 12 = 108 \text{ in.,} \times 3 = 324 \text{ bar-} \\ \text{leycorns, Ans.}$$

$$(15.) 1 \text{ ft.} \times 12 + 6 \text{ in.} = 18 \text{ in.} : 18 \times 12 = 216 \text{ lines,} \\ \text{Ans.}$$

$$(16.) 16\frac{1}{2} \text{ hands} \times 4 = 66 \text{ in.} : 66 \div 12 = 5 \text{ ft. } 6 \text{ in., Ans.}$$

$$(17.) 24 \text{ chains} \times 4 = 96 \text{ rd.} : 15 \text{ chains} \times 4 = 60 \text{ rd.} : \\ 96 \text{ rd.} \times 60 \text{ rd.} = 5760 \text{ sq. rd.} : 5760 \div 160 = 36 \text{ A., Ans.}$$

$$(18.) 267 \text{ cu. ft.} \times 1728 + 624 \text{ cu. in.} = 462000 \text{ cu. in.} : \\ 462000 \div 231 = 2000 \text{ gal., Ans.}$$

$$(19.) 8^{\circ} \times 60 + 41' = 521' : 521' \times 60 + 45'' = 31305'', \\ \text{Ans.}$$

$$(20.) 61^{\circ} \times 60 + 59' = 3719' : 3719' \times 60 + 28'' = \\ 223168'', \text{ Ans.}$$

$$(21.) 915' \div 60 = 15^{\circ} 15', \text{ Ans.}$$

$$(22.) 3661'' \div 60 = 61' 1'': 61' \div 60 = 1^{\circ} 1'. \text{ Ans. } 1^{\circ} 1' 1''.$$

$$(23.) 6 \text{ gross} \times 12 = 72 \text{ doz.}, \times 5 \text{ ct.} = \$3.60, \text{ Ans.}$$

$$(24.) 4 \text{ score} \times 20 + 10 \text{ yr.} = 90 \text{ yr.}, \text{ Ans.}$$

$$(25.) 3 \text{ bdl.} \times 2 = 6 \text{ rm.}, \times 20 = 120 \text{ qr.}: 120 @ 18 \text{ ct.} = \$21.60, \text{ Ans.}$$

$$(26.) 336 \text{ pp.} \div 2 = 168 \text{ leaves}: 168 \div 12 = 14 \text{ sheets, Ans.}$$

$$(27.) 512 + 528 + 528 + 512 + 496 = 2576 \text{ pp.}, \div 2 = 1288 \text{ leaves}: 1288 \div 8 = 161 \text{ sheets}, \div 24 = 6 \text{ qr. } 17 \text{ sheets, Ans.}$$

Art. 74.

$$(1.) 2 \text{ bu.} \times 4 \times 8 \times 2 = 128 \text{ pt.}: 5 \text{ ct.} \times 128 = 640 \text{ ct.} = \$6.40, \text{ Ans.}$$

$$(2.) 3 \text{ bu.} \times 4 + 2 \text{ pk.} = 14 \text{ pk.}: 50 \text{ ct.} \times 14 = 700 \text{ ct.} = \$7.00, \text{ Ans.}$$

$$(3.) 3 \text{ pk.} \times 8 + 3 \text{ qt.} = 27 \text{ qt.}: 27 \text{ qt.} \times 2 = 54 \text{ pt.}: 3 \text{ ct.} \times 54 = \$1.62, \text{ Ans.}$$

$$(4.) \$3 = 300 \text{ ct.}: 300 \text{ ct.} \div 15 \text{ ct.} = 20 \text{ pk.}: 20 \text{ pk.} \div 4 = 5 \text{ bu.}, \text{ Ans.}$$

$$(5.) \$1.66 = 166 \text{ ct.}: 166 \text{ ct.} \div 4 = 41 \text{ qt. and } 2 \text{ ct. over, which will buy } 1 \text{ pt. at } 4 \text{ ct. a qt. } 41 \text{ qt.} \div 8 = 5 \text{ pk. } 1 \text{ qt.}: 5 \text{ pk.} \div 4 = 1 \text{ bu. } 1 \text{ pk.} \text{ Ans. } 1 \text{ bu. } 1 \text{ pk. } 1 \text{ qt. } 1 \text{ pt.}$$

$$\text{Or thus: } 4 \text{ ct. a qt. is } 2 \text{ ct. a pt.}; \text{ and } 166 \text{ ct.} \div 2 \text{ ct.} = 83 \text{ pt.} = 1 \text{ bu. } 1 \text{ pk. } 1 \text{ qt. } 1 \text{ pt.}, \text{ Ans.}$$

$$(6.) 3 \text{ bu. } 2 \text{ pk.} = 14 \text{ pk.}: 91 \text{ bu.} = 364 \text{ pk.}: 364 \text{ pk.} \div 14 \text{ pk.} = 26 \text{ bags, Ans.}$$

(7.) $15 \text{ lb.} \times 16 + 12 \text{ oz.} = 252 \text{ oz.}$: $252 \div 4 = 63$, *Ans.*

(8.) $44 \text{ cwt. } 52 \text{ lb.} = 71232 \text{ oz.}$: $9 \text{ lb. } 15 \text{ oz.} = 159 \text{ oz.}$:
 $71232 \div 159 = 448$, *Ans.*

(9.) $14 \text{ cwt. } 28 \text{ lb.} = 1428 \text{ lb.}$: $1428 \div 84 = 17$, *Ans.*

(10.) $7 \text{ cwt. } 56 \text{ lb.} = 756 \text{ lb.}$: $756 \div 12 = 63$, *Ans.*

(11.) $6 \text{ cwt. } 10 \text{ lb.} = 9760 \text{ oz.}$: $3 \text{ lb. } 13 \text{ oz.} = 61 \text{ oz.}$:
 $9760 \div 61 = 160$, *Ans.*

(12.) $2 \text{ A. } 125 \text{ sq. rd.} = 445 \text{ sq. rd.}$: $20 \text{ ct.} \times 445 = 8900$
 $\text{ct.} = \$89$, *Ans.*

(13.) $16 \text{ A. } 53 \text{ sq. rd.} = 2613 \text{ sq. rd.}$: $1 \text{ A. } 41 \text{ sq. rd.} =$
 201 sq. rd. : $2613 \div 201 = 13$, *Ans.*

(14.) $2 \text{ ft.} \times 2 \text{ ft.} \times 2 \text{ ft.} = 8 \text{ cu. ft.}$: $8 \text{ cu. ft.} \times 1728 =$
 13824 cu. in. , *Ans.*

(15.) $1000 \text{ oz.} \times 5 = 5000 \text{ oz.} = 312 \text{ lb. } 8 \text{ oz.}$, *Ans.*

(16.) $1000 \text{ oz.} \times 128 = 128000 \text{ oz.} = 4 \text{ T.}$, *Ans.*

(17.) $2 \text{ C.} \times 128 = 256 \text{ cu. ft.}$: $950 \text{ oz.} \times 256 = 243200$
 $\text{oz.} = 7 \text{ T. } 12 \text{ cwt.}$, *Ans.*

(18.) $63 \text{ gal.} \times 4 \times 2 = 504 \text{ pt.}$: $20 \text{ ct.} \times 504 = 10080$
 $\text{ct.} = \$100.80$, *Ans.*

(19.) $31 \text{ gal. } 2 \text{ qt.} = 126 \text{ qt.}$: $126 \text{ qt.} \times 5 = 630 \text{ qt.}$: 10
 $\text{ct.} \times 630 = 6300 \text{ ct.} = \63 , *Ans.*

(20.) $\$2 = 200 \text{ ct.}$: $200 \div 5 = 40 \text{ pt.}$: $40 \text{ pt.} = 5 \text{ gal.}$,
Ans.

(21.) $63 \text{ gal.} = 504 \text{ pt.}$: $3 \text{ qt. } 1 \text{ pt.} = 7 \text{ pt.}$: $7 \text{ pt.} \times 12$
 $= 84 \text{ pt. in } 1 \text{ doz. bottles}$: $504 \div 84 = 6 \text{ doz.}$, *Ans.*

(22.) $4 \text{ gal. } 3 \text{ qt. } 1 \text{ pt.} = 39 \text{ pt.}$: $58 \text{ gal. } 2 \text{ qt.} = 468 \text{ pt.}$:
 $468 \div 39 = 12$, *Ans.*

(23.) 1 da. = 1440 min.: 70 beats \times 1440 = 100800 beats, *Ans.*

(24.) 1876 is a leap year, because it is exactly divisible by 4; hence, February has 29 days: 29 days = 2505600 seconds, *Ans.*

(25.) 3 wk. 2 da. 3 hr. = 555 hr.: 8 mi. \times 555 = 4440 mi., *Ans.*

(26.) A peck is $\frac{1}{4}$ bushel, and will, therefore, cost $\frac{1}{4}$ of 44 ct. = 11 ct. per day: 365 \times 11 = \$40.15, *Ans.*

(27.) 40 bbl. \times 196 = 7840 lb. The gain equals 5 ct. — 3 ct., or 2 ct., a pound. 7840 \times 2 ct. = \$156.80, *Ans.*

Art. 75.

(4.) 17 bu. 3 pk. 7 qt., *Ans.*

(5.) 26 bu. 1 qt. 1 pt., *Ans.*

(6.) 24 qt., *Ans.*

(7.) 128 gal. 3 qt. 1 pt. 3 gi., *Ans.*

(8.) 79 T. 15 cwt. 48 lb. 6 oz., *Ans.*

(9.) 57 cwt. 51 lb. 7 oz., *Ans.*

(10.) 111 mi. 44 rd., *Ans.*

(11.) 14 yd. 4 in., *Ans.*

(12.) 299 A. 150 sq. rd., *Ans.*

(13.) 51 sq. yd. 4 sq. ft. 73 sq. in., *Ans.*

(14.) 49 C. 58 cu. ft. 519 cu. in., *Ans.*

(15.) 143 cu. yd. 2 cu. ft. 990 cu. in., *Ans.*

(16.) 50 da. 3 hr. 12 min. 28 sec., *Ans.*

(17.) 8 mo. 4 da. 8 hr. 49 min. 35 sec., *Ans.*

(18)	
bu.	pk.
21	3
14	1
23	2
18	1
22	1
<hr/>	
100	0

(19)	
bu.	pk.
200	3
143	1
400	3
255	1
<hr/>	
1000	0

(20)	
cwt.	lb.
8	36
4	64
5	19
7	75
7	84
<hr/>	
33	78

(21)	
lb.	oz.
13	11
17	13
14	14
16	0
19	7
17	9
<hr/>	
99	6

(22)	
mi.	rd.
104	50
95	270
<hr/>	
200	0

(23)	
A.	sq. rd.
186	134
286	17
113	89
<hr/>	
586	80

(24)		
sq. yd.	sq. ft.	sq. in.
17	3	119
18	0	141
23	7	0
29	5	116
<hr/>		
88	8	88

(25)	
C.	cu. ft.
7	78
16	24
35	127
29	10
<hr/>	
88	111

(26)		
hhd. gal.	qt.	pt.
4642	3	1
945	0	0
1707	0	1
10206	1	0
<hr/>		
277	50	1 0

Art. 76.(4.) 3 gal. 3 qt. 1 pt., *Ans.*(5.) 19 gal. 1 qt. 1 pt. 3 gi., *Ans.*(6.) 3 T. 18 cwt. 75 lb., *Ans.*(7.) 11 T. 42 lb. 15 oz., *Ans.*(8.) 6 mi. 282 rd., *Ans.*

(9.) 1 yd. 2 ft. 11 in., *Ans.*

(10.) 249 A. 153 sq. rd., *Ans.*

(11.) 2 sq. yd. 8 sq. ft. 104 sq. in., *Ans.*

(12.) 8 C. 125 cu. ft., *Ans.*

(13.) 8 cu. yd. 18 cu. ft. 1727 cu. in., *Ans.*

(14.) 51 min. 42 sec., *Ans.*

(15.) 55 da. 5 hr. 55 min. 55 sec., *Ans.*

(16)		
bu.	pk.	qt.
4	0	0
2	1	1
<hr/>		
1	2	7

(17)			
bu.	pk.	qt.	pt.
100	0	0	0
24	0	0	1
<hr/>			
75	3	7	1

(18)	
lb.	oz.
46	4
19	8
<hr/>	
26	12

(19)	
cwt.	lb.
32	66
8	67
<hr/>	
23	99

(20)	
mi.	rd.
24899	0
100	41
<hr/>	
24798	279

(21)	
A.	sq. rd.
146	80
86	94
<hr/>	
59	146

(22)	
C.	cu. ft.
8	50
3	75
<hr/>	
4	103

(23)			
gal.	qt.	pt.	gi.
63	0	0	0
51	1	0	2
<hr/>			
11	2	1	2

(24)			
da.	hr.	min.	sec.
5	10	27	15
2	4	13	29
<hr/>			
3	6	13	46

Art. 77.

(2)		
yr.	mo.	da.
1876	9	1
1776	7	4
<hr/>		
100	1	27

(3)		
yr.	mo.	da.
1191	7	12
1099	7	15
<hr/>		
91	11	27

(4)		
yr.	mo.	da.
1587	2	8
1215	6	15
<hr/>		
371	7	23

(5)		
yr.	mo.	da.
1688	11	5
1066	10	14
<hr/>		
622	0	21

(6)		
yr.	mo.	da.
1815	6	18
1805	12	2
<hr/>		
9	6	16

Art. 78.

(2)	(3)	(4)	(5)	(6)
da.	da.	da.	da.	da.
Mar. 14	12	25	19	11
Apr. 30	31	31	30	30
May 31	20	30	31	31
June 30	<hr/> 63 da.	7	31	30
July 31		<hr/> 93 da.	28	31
Aug. 31			31	31
Sept. 12			30	29
<hr/> 179 da.			25	8
			<hr/> 225 da.	<hr/> 201 da.

Art. 79.

(2)				(3)			(4)			
bu.	pk.	qt.	pt.	bu.	pk.	qt.	bu.	pk.	qt.	pt.
2	1	1	1	2	2	2	4	3	3	1
			6			9				12
<hr/> 13 3 1 0				<hr/> 23 0 2			<hr/> 58 1 2 0			

(5)	
T.	cwt. lb.
8	62
	9
<hr/> 3 17 58	

(6)	
T.	cwt. lb.
10	89
	7
<hr/> 3 16 23	

(7)	
mi.	rd.
208	176
	15
<hr/> 3128 80	

(8)			(9)			(10)		
cu. yd.	cu. ft.	cu. in.	T. cwt.	lb.		gal.	qt.	pt.
23	9	228	16	74		47	3	1
		12		119				59
280	1	1008	99	12	6	2824	2	1

(11)		(12)		(13)				
mi.	rd.	C.	cu. ft.	mo.	wk.	da.	hr.	min. sec.
27	155	7	98		2	4	13	48 39
	31		17					75
852	5	132	2	49	3	0	3	48 45

		(14)
cwt.	lb.	813 cwt. = 81300 lb.
10	84	8 ct. — 6 ct. = 2 ct., gain on 1 lb.
	75	2 ct. \times 81300 = 162600 ct. = \$1626, Ans.
813	0	

(15)
4 cwt. 85 lb. = 485 lb.
485 lb. \times 425 = 206125 lb.
206125 \times 13 ct. = \$26796.25
\$26796.25 — \$24735 = \$2061.25, Ans.

DIVISION.

Art. 80.

(4)				(5)			(6)	
bu.	pk.	qt.	pt.	cwt.	lb.	oz.	mi.	rd.
5)67	3	4	1	11)35	44	12	7)39	288
13	2	2	1	3	22	4	5	224

$$\begin{array}{r}
 (7) \\
 \text{A. sq. rd.} \\
 16 \overline{) 69 \ 64} \\
 \underline{4 \ 54}
 \end{array}$$

$$\begin{array}{r}
 (8) \\
 \text{bu. pk. qt.} \\
 10 \overline{) 490 \ 2 \ 4} \\
 \underline{10 \ 49 \ 0 \ 2} \\
 \text{Ans. } 4 \ 3 \ 5
 \end{array}$$

$$\begin{array}{r}
 (9) \\
 \text{lb. oz.} \\
 5 \overline{) 265 \ 10} \\
 \underline{10 \ 53 \ 2} \\
 \text{Ans. } 5 \ 5
 \end{array}$$

$$\begin{array}{r}
 (10) \\
 \text{T. cwt.} \\
 17 \overline{) 45 \ 18} \\
 \underline{2 \ 14}
 \end{array}$$

$$\begin{array}{r}
 (11) \\
 \text{dr. hr. min. sec.} \\
 6 \overline{) 114 \ 22 \ 45 \ 18} \\
 \underline{9 \ 19 \ 3 \ 47 \ 33} \\
 \text{Ans. } 2 \ 3 \ 5 \ 17
 \end{array}$$

$$\begin{array}{r}
 (12) \\
 \text{lb. oz.} \\
 27 \ 13 \\
 10 \text{ cwt.} = 1000 \\
 23 \overline{) 1027} (44 \text{ lb.} \\
 \underline{92} \\
 -107 \\
 \underline{92} \\
 15 \\
 15 \times 16 + 13 \text{ oz.} \div 23 = 11 \text{ oz.} \\
 \text{Ans. } 44 \text{ lb. } 11 \text{ oz.}
 \end{array}$$

$$\begin{array}{r}
 (13) \\
 \text{bu. pk. qt. bu. pk. qt.} \\
 78 \overline{) 309 \ 2 \ 2 \ (3 \ 3 \ 7, \text{ Ans.}} \\
 \underline{234} \\
 75 \\
 \underline{4} \\
 78 \overline{) 302} (3 \text{ pk.} \\
 \underline{234} \\
 68 \\
 \underline{8} \\
 78 \overline{) 546} (7 \text{ qt.} \\
 \underline{546}
 \end{array}$$

$$\begin{array}{r}
 (14) \\
 \text{gal. qt. pt. gi.} \\
 63 \overline{) 127} \\
 \text{gal. } 2 \ . \ . \ 1 \\
 \underline{4} \text{ qt. qt.} \\
 4 + 3 = 7 \\
 \text{pt.} \quad \underline{2} \text{ pt. pt.} \\
 15 \quad 14 + 1 = 15 \\
 \underline{4} \\
 60 + 3 \text{ gi.} = 63 \text{ gi.} \\
 63 \div 63 = 1 \text{ gi.} \\
 \text{Ans. } 2 \text{ gal. } 1 \text{ gi.}
 \end{array}$$

$$\begin{array}{r}
 \text{(15)} \\
 \text{mi. rd. mi. rd.} \\
 319)788 \quad 169 \text{ (2 151, } \textit{Ans.} \\
 \underline{638}
 \end{array}$$

$$150 \times 320 = 48000 \text{ rd.}$$

$$\begin{array}{r}
 169 \\
 319)48169(151 \text{ rd.} \\
 \underline{319} \\
 1626 \\
 \underline{1595}
 \end{array}$$

$$\begin{array}{r}
 319 \\
 1626 \\
 \underline{1595}
 \end{array}$$

$$160 \text{ sq. rd.} + 155 \text{ sq. rd.} = 315 \text{ sq. rd.}$$

$$315 \text{ sq. rd.} \div 3 = 105 \text{ sq. rd.}$$

$$\textit{Ans.} 50 \text{ A. } 105 \text{ sq. rd}$$

$$\begin{array}{r}
 \text{(16)} \\
 \text{A. sq. rd.} \\
 104 \quad 117 \\
 \underline{87 \quad 78} \\
 191 \quad 195 \\
 \underline{40 \quad 40} \\
 3)151 \quad 155 \\
 \underline{50 \dots 1} = 160 \text{ sq. rd.}
 \end{array}$$

$$\begin{array}{r}
 \text{(17)} \\
 \text{bu. pk.} \\
 5000 \quad 3 \\
 \underline{7245 \quad 2} \\
 12245 \quad 5 \\
 \underline{8022 \quad 1}
 \end{array}$$

$$4223 \quad 4 = 4224 \text{ bu.}$$

$$4224 \div 8 = 528 \text{ bu., } \textit{Ans.}$$

$$\begin{array}{r}
 \text{(18)} \\
 \text{A. sq. rd.} \\
 4 \quad 80 \\
 \underline{160} \\
 640 + 80 = 720 \text{ sq. rd.}
 \end{array}$$

$$720 \text{ sq. rd.} \times 6 = 4320 \text{ sq. rd.}$$

$$54)4320(80 \text{ sq. rd. in each lot.}$$

$$\begin{array}{r}
 432 \\
 \underline{} \\
 0
 \end{array}$$

$$80 \times \$5 = \$400, \textit{Ans.}$$

$$\begin{array}{r}
 \text{(19)} \\
 \text{lb. oz.} \\
 35 \quad 9 \\
 75 \quad 14 \\
 \underline{85 \quad 15} \\
 195 \quad 38 \\
 \underline{186 \quad 14} \\
 9 \quad 24 \\
 \underline{ \quad 8} \\
 72 \quad 192 = 84 \text{ lb.}
 \end{array}$$

Art. 81.

$$\begin{array}{r} (1) \\ 15 \overline{) 18^{\circ} \quad 25' \quad 30''} \\ 1 \text{ hr. } 13 \text{ min. } 42 \text{ sec.} \end{array}$$

$$\begin{array}{r} (2) \\ 30^{\circ} \div 15 = 2. \text{ Ans. } 2 \text{ hr.} \end{array}$$

$$\begin{array}{r} (3) \\ 15 \overline{) 71^{\circ} \quad 4' \quad 0''} \\ 4 \text{ hr. } 44 \text{ min. } 16 \text{ sec.} \end{array}$$

$$\begin{array}{r} (4) \\ 15 \overline{) 10^{\circ} \quad 35' \quad 0''} \\ 0 \text{ hr. } 42 \text{ min. } 20 \text{ sec} \end{array}$$

$$\begin{array}{r} (5) \\ \text{min. sec.} \\ 37 \quad 20 \\ 15 \\ \hline 9^{\circ} \quad 20' \quad 0'' \end{array}$$

$$\begin{array}{r} (6) \\ \text{hr. min. sec.} \\ 1 \quad 4 \quad 56 \\ 15 \\ \hline 16^{\circ} \quad 14' \quad 0'' \end{array}$$

$$\begin{array}{r} (7) \\ \text{hr. min. sec.} \\ 5 \quad 8 \quad 4 \\ 15 \\ \hline 77^{\circ} \quad 1' \quad 0'' \end{array}$$

Art. 82.

(8)	(9)
hr. min. sec.	hr. min. sec.
Time at C. 12 0 0	Time at N. Y. 11 0 0 A. M.
Add diff. 37 20	30° = 2 0 0 to be added.
12 37 20	1 0 0 P. M.
(See Ex. 5, Art. 81.)	

(10)	(11)
hr. min. sec.	hr. min. sec.
Time at Ph. 12 0 0	Time at N. Y. 11 0 0
Subtr. diff. 37 20	Subtr. diff. 1 4 56
11 22 40 A. M.	9 55 4 A. M.
(See Ex. 6, Art. 81.)	

(12)

$$124^{\circ}-80^{\circ} 42'=43^{\circ} 18': 43^{\circ} 18' \div 15=2 \text{ hr. } 53 \text{ min. } 12 \text{ sec.}$$

hr. min. sec.

Time at W. 1 0 0

Subtr. diff. 2 53 12

Ans. 10 6 48 A. M.

the remainder is the 10th hr. from midnight, or 10 A. M.

NOTE.—In performing the subtraction, we can not take 3 hr. from 1 hr., but 1 P. M. is the 13th hour from midnight, from which, after taking 3 hr.,

FACTORING.

Arts. 87 and 88.

NOTE.—The principles and processes of factoring are so simple, and are so fully explained in the Arithmetic, that it seems unnecessary to give any solutions here.

Art. 89.

$$\begin{array}{r} (2) \\ 2 \overline{)16} \quad 2 \overline{)24} \quad 2 \overline{)40} \\ \underline{2 \overline{)8}} \quad \underline{2 \overline{)12}} \quad \underline{2 \overline{)20}} \\ \underline{2 \overline{)4}} \quad \underline{2 \overline{)6}} \quad \underline{2 \overline{)10}} \\ \underline{2 \overline{)2}} \quad \underline{\quad 3} \quad \underline{\quad 5} \\ 1 \end{array}$$

$$2 \times 2 \times 2 = 8, \text{ G. C. D.}$$

$$\begin{array}{r} (3) \\ 2 \overline{)24} \quad 2 \overline{)36} \quad 2 \overline{)60} \\ \underline{2 \overline{)12}} \quad \underline{2 \overline{)18}} \quad \underline{2 \overline{)30}} \\ \underline{3 \overline{)6}} \quad \underline{3 \overline{)9}} \quad \underline{3 \overline{)15}} \\ \underline{2 \overline{)2}} \quad \underline{3 \overline{)3}} \quad \underline{\quad 5} \\ 1 \quad 1 \end{array}$$

$$2 \times 2 \times 3 = 12, \text{ G. C. D.}$$

$$\begin{array}{r} (4) \\ 2 \overline{)36} \quad 54 \quad 90 \\ \underline{3 \overline{)18}} \quad \underline{27} \quad \underline{45} \\ \underline{3 \overline{)6}} \quad \underline{9} \quad \underline{15} \\ \underline{\quad 2} \quad \underline{\quad 3} \quad \underline{\quad 5} \end{array}$$

$$2 \times 3 \times 3 = 18, \text{ G. C. D.}$$

$$\begin{array}{r} (5) \\ 2 \overline{)40} \quad 60 \quad 100 \\ \underline{2 \overline{)20}} \quad \underline{30} \quad \underline{50} \\ \underline{5 \overline{)10}} \quad \underline{15} \quad \underline{25} \\ \underline{\quad 2} \quad \underline{\quad 3} \quad \underline{\quad 5} \end{array}$$

$$2 \times 2 \times 5 = 20, \text{ G. C. D.}$$

$$\begin{array}{r}
 \text{(6)} \\
 3 \overline{)54} \quad 81 \quad 108 \\
 3 \overline{)18} \quad 27 \quad 36 \\
 3 \overline{)6} \quad 9 \quad 12 \\
 \quad 2 \quad 3 \quad 4 \\
 3 \times 3 \times 3 = 27, \text{ G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(7)} \\
 2 \overline{)60} \quad 90 \quad 120 \\
 3 \overline{)30} \quad 45 \quad 60 \\
 5 \overline{)10} \quad 15 \quad 20 \\
 \quad 2 \quad 3 \quad 4 \\
 2 \times 3 \times 5 = 30, \text{ G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(8)} \\
 2 \overline{)32} \quad 48 \quad 80 \quad 112 \\
 2 \overline{)16} \quad 24 \quad 40 \quad 56 \\
 2 \overline{)8} \quad 12 \quad 20 \quad 28 \\
 2 \overline{)4} \quad 6 \quad 10 \quad 14 \\
 \quad 2 \quad 3 \quad 5 \quad 7 \\
 2 \times 2 \times 2 \times 2 = 16, \text{ G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(9)} \\
 2 \overline{)48} \quad 72 \quad 96 \quad 120 \\
 2 \overline{)24} \quad 36 \quad 48 \quad 60 \\
 2 \overline{)12} \quad 18 \quad 24 \quad 30 \\
 3 \overline{)6} \quad 9 \quad 12 \quad 15 \\
 \quad 2 \quad 3 \quad 4 \quad 5 \\
 2 \times 2 \times 2 \times 3 = 24, \text{ G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(10)} \\
 2 \overline{)72} \quad 108 \quad 144 \quad 180 \\
 2 \overline{)36} \quad 54 \quad 72 \quad 90 \\
 3 \overline{)18} \quad 27 \quad 36 \quad 45 \\
 3 \overline{)6} \quad 9 \quad 12 \quad 15 \\
 \quad 2 \quad 3 \quad 4 \quad 5 \\
 2 \times 2 \times 3 \times 3 = 36, \text{ G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(11)} \\
 \text{(By 2d method.)} \\
 62 \overline{)93(1} \\
 \quad 62 \\
 \quad \quad 31 \overline{)62(2} \\
 \quad \quad \quad 62 \\
 \quad \quad \quad 31 = \text{G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(12)} \\
 78 \overline{)130(1} \\
 \quad 78 \\
 \quad \quad 52 \overline{)78(1} \\
 \quad \quad \quad 52 \\
 \quad \quad \quad 26 \overline{)52(2} \\
 \quad \quad \quad \quad 52 \\
 26 = \text{G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(13)} \\
 161 \overline{)253(1} \\
 \quad 161 \\
 \quad \quad 92 \overline{)161(1} \\
 \quad \quad \quad 92 \\
 \quad \quad \quad 69 \overline{)92(1} \\
 \quad \quad \quad \quad 69 \\
 \quad \quad \quad 23 \overline{)69(3} \\
 \quad \quad \quad \quad 69 \\
 23 = \text{G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 \text{(14)} \\
 247 \overline{)323(1} \\
 \quad 247 \\
 \quad \quad 76 \overline{)247(3} \\
 \quad \quad \quad 228 \\
 \quad \quad \quad 19 \overline{)76(4} \\
 \quad \quad \quad \quad 76 \\
 19 = \text{G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 (16) \\
 2145)3471(1 \\
 \underline{2145} \\
 1326)2145(1 \\
 \underline{1326}
 \end{array}$$

$$\begin{array}{r}
 819)1326(1 \\
 \underline{819} \\
 39 = \text{G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 (15) \\
 391)697(1 \\
 \underline{391} \\
 306)391(1 \\
 \underline{306} \\
 85)306(3 \\
 \underline{255} \\
 51)85(1 \\
 \underline{51} \\
 34)51(1 \\
 \underline{34} \\
 17 = \text{G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 (17) \\
 16571)38363(2 \\
 \underline{33142} \\
 5221)16571(3 \\
 \underline{15663} \\
 908)5221(5 \\
 \underline{4540} \\
 681)908(1 \\
 \underline{681} \\
 227 = \text{G. C. D.}
 \end{array}$$

$$\begin{array}{r}
 312)507(1 \\
 \underline{312} \\
 195)312(1 \\
 \underline{195} \\
 117)195(1 \\
 \underline{117} \\
 78)117(1 \\
 \underline{78} \\
 39)78(2 \\
 \underline{78}
 \end{array}$$

$$\begin{array}{r}
 (18) \qquad (19) \\
 72)120(1 \quad 24)132(5 \quad 75)125(1 \quad 25)165(6 \\
 \underline{72} \quad \underline{120} \quad \underline{75} \quad \underline{150} \\
 48)72(1 \quad 12)24(2 \quad 50)75(1 \quad 15)25(1 \\
 \underline{48} \quad \underline{24} \quad \underline{50} \quad \underline{15} \\
 24)48(2 \quad 12 = \text{G. C. D.} \quad 25)50(2 \quad 10)15(1 \\
 \underline{48} \quad \underline{50} \quad \underline{10}
 \end{array}$$

$$\begin{array}{r}
 (20) \\
 2)64 \quad 96 \quad 112 \quad 136 \\
 \underline{2)32} \quad \underline{48} \quad \underline{56} \quad \underline{68} \\
 2)16 \quad 24 \quad 28 \quad 34 \\
 \underline{8} \quad \underline{12} \quad \underline{14} \quad \underline{17} \\
 2 \times 2 \times 2 = 8, \text{ G. C. D.}
 \end{array}$$

Art. 90.

$$\begin{array}{r}
 \text{(2)} \\
 2) \overline{4 \quad 6 \quad 8} \\
 2) \overline{2 \quad 3 \quad 4} \\
 \quad 2) \overline{3 \quad 2} \\
 \quad \quad 3
 \end{array}$$

$$2 \times 2 \times 2 \times 3 = 24, \text{ L. C. M.}$$

$$\begin{array}{r}
 \text{(3)} \\
 3) \overline{6 \quad 9 \quad 12} \\
 2) \overline{2 \quad 3 \quad 4} \\
 \quad \quad 3 \quad 2
 \end{array}$$

$$3 \times 2 \times 3 \times 2 = 36, \text{ L. C. M.}$$

$$\begin{array}{r}
 \text{(4)} \\
 2) \overline{4 \quad 8 \quad 10} \\
 2) \overline{2 \quad 4 \quad 5} \\
 \quad \quad 2 \quad 5
 \end{array}$$

$$2 \times 2 \times 2 \times 5 = 40, \text{ L. C. M.}$$

$$\begin{array}{r}
 \text{(5)} \\
 5) \overline{6 \quad 10 \quad 15} \\
 3) \overline{6 \quad 2 \quad 3} \\
 2) \overline{2 \quad 2}
 \end{array}$$

$$5 \times 3 \times 2 = 30, \text{ L. C. M.}$$

$$\begin{array}{r}
 \text{(6)} \\
 3) \overline{6 \quad 8 \quad 9 \quad 12} \\
 2) \overline{2 \quad 8 \quad 3 \quad 4} \\
 \quad 2) \overline{4 \quad 3 \quad 2} \\
 \quad \quad 2 \quad 3
 \end{array}$$

$$3 \times 2 \times 2 \times 2 \times 3 = 72, \text{ L. C. M.}$$

$$\begin{array}{r}
 \text{(7)} \\
 5) \overline{10 \quad 12 \quad 15 \quad 20} \\
 2) \overline{2 \quad 12 \quad 3 \quad 4} \\
 \quad 3) \overline{6 \quad 3 \quad 2} \\
 \quad \quad 2) \overline{2 \quad 2}
 \end{array}$$

$$5 \times 2 \times 3 \times 2 = 60, \text{ L. C. M.}$$

$$\begin{array}{r}
 \text{(8)} \\
 3) \overline{9 \quad 15 \quad 18 \quad 30} \\
 5) \overline{3 \quad 5 \quad 6 \quad 10} \\
 3) \overline{3 \quad \quad 6 \quad 2} \\
 \quad \quad 2) \overline{2 \quad 2}
 \end{array}$$

$$3 \times 5 \times 3 \times 2 = 90, \text{ L. C. M.}$$

$$\begin{array}{r}
 \text{(9)} \\
 3) \overline{12 \quad 18 \quad 27 \quad 36} \\
 3) \overline{4 \quad 6 \quad 9 \quad 12} \\
 2) \overline{4 \quad 2 \quad 3 \quad 4} \\
 2) \overline{2 \quad \quad 3 \quad 2} \\
 \quad \quad \quad 3
 \end{array}$$

$$3 \times 3 \times 2 \times 2 \times 3 = 108, \text{ L. C. M.}$$

(10)			
5)15	25	30	50
5)3	5	6	10
2)3		2	2
3			

$$5 \times 5 \times 2 \times 3 = 150, \text{ L. C. M.}$$

(11)			
7)14	21	30	35
5)2	3	30	5
3)2	3	6	
2)2		2	

$$7 \times 5 \times 3 \times 2 = 210, \text{ L. C. M.}$$

(12)			
7)15	20	21	28
5)15	20	3	4
3)3	4	3	4
2)4			4
2)2			2

$$7 \times 5 \times 3 \times 2 \times 2 = 420, \text{ L. C. M.}$$

(13)			
5)20	24	28	30
3)4	24	28	6
2)4	8	28	2
2)2	4	14	
	2	7	

$$5 \times 3 \times 2 \times 2 \times 2 \times 7 = 840, \\ \text{L. C. M.}$$

(14)			
7)45	30	35	42
5)45	30	5	6
3)9	6		6
2)3	2		2
3			

$$7 \times 5 \times 3 \times 2 \times 3 = 630, \text{ L. C. M.}$$

(15)			
5)36	40	45	50
3)36	8	9	10
2)12	8	3	10
2)6	4	3	5
3)3	2	3	5
	2		5

$$5 \times 3 \times 2 \times 2 \times 3 \times 2 \times 5 = 1800, \text{ L. C. M.}$$

(16)		
7)42	56	63
3)6	8	9
2)2	8	3
2)4		3
2		3

$$7 \times 3 \times 2 \times 2 \times 2 \times 3 = 504, \\ \text{L. C. M.}$$

(17)		
13)78	104	117
3)6	8	9
2)2	8	3
2)4		3
2		3

$$13 \times 3 \times 2 \times 2 \times 2 \times 3 = 936, \\ \text{L. C. M.}$$

(18)	(19)
5)125 150 200	5)10 24 25 32 45
5)25 30 40	3)2 24 5 32 9
2)5 6 8	2)2 8 5 32 3
2)5 3 4	2)4 5 16 3
5 3 2	2)2 5 8 3
5×5×2×2×5×3×2=3000, L. C. M.	2)5 4 3
	5 2 3
	5×3×2×2×2×2×5×2×3=7200, L. C. M.

(20)								
3)2	3	4	5	6	7	8	9	
2)2		4	5	2	7	8	3	
		2)2	5		7	4	3	
			5		7	2	3	
3×2×2×5×7×2×3=2520, L. C. M.								

(21)	(22)
3)16 27 42 108	13)13 29 52 87
2)16 9 14 36	29)29 4 87
3)8 9 7 18	2)4 3
3)8 3 7 6	2 3
2)8 7 2	13×29×2×2×3=4524,
2)4 7	L. C. M.
2 7	
3×2×3×3×2×2×2×7=3024, L. C. M.	

		(23)		
5)	120	360	144	720
	72			
3)	24	72	144	144
	72			
3)	8	24	48	48
	24			
2)	8	8	16	16
	16			
2)	4	4	8	8
	8			
2)	2	2	4	4
	4			
		2)	2	

$$5 \times 3 \times 3 \times 2 \times 2 \times 2 \times 2 = 720, \text{ L. C. M.}$$

CANCELLATION.

Art. 91.

$$(4.) \frac{1\cancel{3} \times 4}{1\cancel{3}} = 4, \text{ Ans.}$$

$$(5.) \frac{17 \times \cancel{18}}{\cancel{6}} = 51, \text{ Ans.}$$

$$(6.) \frac{15 \times \cancel{8}}{\cancel{4}} = 30, \text{ Ans.}$$

$$(7.) \frac{\cancel{24} \times 4}{\cancel{8}} = 12, \text{ Ans.}$$

$$(8.) \frac{37 \times \cancel{15}}{\cancel{5}} = 111, \text{ Ans.}$$

$$(9.) \frac{\cancel{36} \times \cancel{40}}{\cancel{30} \times \cancel{8}} = 6, \text{ Ans.}$$

$$(10.) \frac{\cancel{36} \times \cancel{5}}{\cancel{15}} = 12, \text{ Ans.}$$

$$(11.) \frac{\cancel{42} \times \cancel{25} \times \cancel{18}}{\cancel{21} \times \cancel{15}} = 60, \text{ Ans.}$$

$$(12.) \frac{23 \times \cancel{10}}{\cancel{5}} = 46, \text{ Ans.}$$

$$(13.) \frac{\cancel{15} \times \cancel{14}}{\cancel{35}} = 6, \text{ Ans.}$$

$$(14.) \quad \begin{array}{cccc} & 3 & & 2 \\ 21 & \times 11 & \times 6 & \times 26 \\ 13 & \times 3 & \times 14 & \times 2 \end{array} = 33, \text{ Ans.}$$

$$(15.) \quad \begin{array}{cccccc} & 7 & & 3 & & 2 & & 7 \\ 21 & \times 15 & \times 33 & \times 8 & \times 14 & \times 17 \\ 20 & \times 34 & \times 22 & \times 27 \\ 4 & 17 & 2 & 9 \\ & & & 3 \end{array} = 49, \text{ Ans.}$$

$$(16.) \quad \begin{array}{ccc} & 3 & 19 & 2 \\ 21 & \times 95 & \times 6 \\ 35 & \times 9 \\ 5 & 3 \end{array} = 38, \text{ Ans.}$$

$$(17.) \quad \begin{array}{ccc} & & 2 \\ 5 & 3 & 4 \\ 35 & \times 39 & \times 40 \\ 26 & \times 30 & \times 42 \\ 2 & 3 & 6 \\ & & 3 \end{array} = \frac{5}{3} = 1\frac{2}{3}, \text{ Ans.}$$

$$(18.) \quad \begin{array}{ccc} 13 & 11 & 7 \\ 26 & \times 33 & \times 35 \\ 4 & \times 9 & \times 25 \\ 2 & 3 & 5 \end{array} = \frac{13 \times 11 \times 7}{2 \times 3 \times 5} = \frac{1001}{30} = 33\frac{11}{30}, \text{ Ans.}$$

$$(19.) \quad \begin{array}{ccc} & 3 & 3 \\ 6 & \times 9 & \times 15 & \times 21 \\ 4 & \times 6 & \times 10 & \times 14 \\ & 2 & 2 \end{array} = 5\frac{1}{16}, \text{ Ans.}$$

$$(20.) \quad \begin{array}{cccc} & 2 & & \\ 3 & 4 & 7 & 7 \\ 21 & \times 24 & \times 28 & \times 35 \\ 14 & \times 18 & \times 20 & \times 25 \\ 2 & 3 & 5 & 5 \end{array} = \frac{98}{25} = 3\frac{23}{25}, \text{ Ans.}$$

FRACTIONS.

Art. 103.

- (8.) 4 times $\frac{7}{7} = \frac{28}{7}$, or $\frac{7}{7} \times 4 = \frac{28}{7}$.
 (9.) 8 times $\frac{9}{9} = \frac{72}{9}$, or $\frac{9}{9} \times 8 = \frac{72}{9}$.
 (10.) 19 times $\frac{13}{13} = \frac{247}{13}$, or $\frac{13}{13} \times 19 = \frac{247}{13}$.
 (11.) $\frac{20}{20} \times 25 = \frac{500}{20}$.
 (12.) $\frac{23}{23} \times 37 = \frac{851}{23}$.

Art. 104.

- (2.) $\frac{2}{2} \times 4 + \frac{1}{2} = \frac{9}{2}$.
 (3.) $\frac{3}{3} \times 2 + \frac{1}{3} = \frac{7}{3}$.
 (8.) $\frac{6}{6} \times 15 + \frac{5}{6} = \frac{95}{6}$.
 (9.) $\frac{24}{24} \times 26 + \frac{13}{24} = \frac{637}{24}$.
 (12.) $\frac{583}{583} \times 21 + \frac{117}{583} = \frac{12360}{583}$.
 (14.) $\frac{71}{71} \times 14 + \frac{6}{71} = \frac{1000}{71}$.

Art. 105.

$$\begin{array}{r} (3) \\ 3 \overline{)6} \\ 2 \end{array}$$

$$\begin{array}{r} (4) \\ 4 \overline{)12} \\ 3 \end{array}$$

$$\begin{array}{r} (5) \\ 4 \overline{)15} \\ 3\frac{3}{4} \end{array}$$

$$\begin{array}{r} (6) \\ 5 \overline{)17} \\ 3\frac{2}{5} \end{array}$$

$$\begin{array}{r} (7) \\ 7 \overline{)19} \\ 2\frac{5}{7} \end{array}$$

$$\begin{array}{r} (8) \\ 10 \overline{)23} \\ 2\frac{3}{10} \end{array}$$

$$\begin{array}{r} (13) \\ 24 \overline{)611} (25\frac{11}{24} \\ 48 \\ \hline 131 \\ 120 \\ \hline 11 \end{array}$$

$$\begin{array}{r} (14) \\ 75 \overline{)3000} (40 \\ 300 \\ \hline 0 \end{array}$$

(15) $\begin{array}{r} 25)775(31 \\ \underline{75} \\ 25 \\ \underline{25} \end{array}$	(16) $\begin{array}{r} 12)171 \\ \underline{14} \frac{3}{2} \end{array}$	(17) $\begin{array}{r} 11)509(46 \frac{3}{11} \\ \underline{44} \\ 69 \\ \underline{66} \\ 3 \end{array}$	(18) $\begin{array}{r} 298)6437(21 \frac{178}{298} \\ \underline{596} \\ 477 \\ \underline{298} \\ 179 \end{array}$
--	---	--	--

(19) $\begin{array}{r} 125)7536(60 \frac{36}{125} \\ \underline{750} \\ 36 \end{array}$	(20) $\begin{array}{r} 19)3781(199 \\ \underline{19} \\ 188 \\ \underline{171} \\ 171 \\ \underline{171} \end{array}$	(21) $\begin{array}{r} 101)1325(13 \frac{12}{101} \\ \underline{101} \\ 315 \\ \underline{303} \\ 12 \end{array}$
--	--	--

Art. 106.

(2.) $\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$, *Ans.*

(3.) $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$, *Ans.*

(4.) $\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$, *Ans.*

(5.) $\frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$, *Ans.*

(6.) $\frac{5}{7} \times \frac{4}{4} = \frac{20}{28}$, *Ans.*

(7.) $\frac{4}{21} \times \frac{4}{4} = \frac{16}{84}$, *Ans.*

(8.) $\frac{7}{8} \times \frac{9}{9} = \frac{63}{72}$, *Ans.*

(9.) $\frac{3}{5} \times \frac{12}{12} = \frac{36}{60}$, *Ans.*

(10.) $\frac{9}{10} \times \frac{10}{10} = \frac{90}{100}$, *Ans.*

(11.) $20 \overline{)720}$; $\frac{9}{20} \times \frac{36}{36} = \frac{324}{720}$, *Ans.*
36

(12.) $14 \overline{)2016(144}$; $\frac{13}{24} \times \frac{144}{144} = \frac{1872}{2016}$, *Ans.*

$$\begin{array}{r} 14 \\ \underline{61} \\ 56 \\ \underline{56} \\ 56 \\ \underline{56} \end{array}$$

(13.) $43)1935(45; \frac{22}{43} \times \frac{45}{45} = \frac{990}{1935}, Ans.$

$$\begin{array}{r} 172 \\ \hline 215 \\ 215 \\ \hline \end{array}$$

(14.) $41)8118(198; \frac{35}{41} \times \frac{198}{198} = \frac{6930}{8118}, Ans.$

$$\begin{array}{r} 41 \\ \hline 401 \\ 369 \\ \hline 328 \\ 328 \\ \hline \end{array}$$

(15.) $17)5134(302; \frac{16}{17} \times \frac{302}{302} = \frac{4832}{5134}, Ans.$

$$\begin{array}{r} 51 \\ \hline 34 \\ 34 \\ \hline \end{array}$$

(16.) $81)23328(288; \frac{77}{81} \times \frac{288}{288} = \frac{22176}{23328}, Ans.$

$$\begin{array}{r} 162 \\ \hline 712 \\ 648 \\ \hline 648 \\ 648 \\ \hline \end{array}$$

(17.) $21)2541(121; \frac{13}{21} \times \frac{121}{121} = \frac{1573}{2541}, Ans.$

$$\begin{array}{r} 21 \\ \hline 44 \\ 42 \\ \hline 21 \\ 21 \\ \hline \end{array}$$

Art. 107.

- (2.) The G. C. D. of 18 and 30 is 6: $6)\frac{18}{30} = \frac{3}{5}$, *Ans.*
- (3.) $10)\frac{60}{90} = \frac{6}{9}$: $3)\frac{6}{9} = \frac{2}{3}$, *Ans.*
- (4.) G. C. D. of 12 and 18 = 6: $6)\frac{12}{18} = \frac{2}{3}$, *Ans.*
- (5.) $5)\frac{30}{45} = \frac{6}{9}$: $3)\frac{6}{9} = \frac{2}{3}$, *Ans.*
- (6.) G. C. D. of 60 and 150 = 30: $30)\frac{60}{150} = \frac{2}{5}$, *Ans.*
- (7.) G. C. D. of 42 and 70 = 14: $14)\frac{42}{70} = \frac{3}{5}$, *Ans.*
- (8.) G. C. D. of 96 and 112 = 16: $16)\frac{96}{112} = \frac{6}{7}$, *Ans.*
- (9.) $5)\frac{60}{125} = \frac{12}{25}$, *Ans.*
- (10.) $2)\frac{126}{198} = \frac{63}{99}$: $9)\frac{63}{99} = \frac{7}{11}$, *Ans.*
- (11.) $2)\frac{182}{196} = \frac{91}{98}$: $7)\frac{91}{98} = \frac{13}{14}$, *Ans.*
- (12.) $5)\frac{615}{915} = \frac{123}{183}$: $3)\frac{123}{183} = \frac{41}{61}$, *Ans.*
- (13.) G. C. D. of 873 and 1067 = 97: $97)\frac{873}{1067} = \frac{9}{11}$, *Ans.*
- (14.) G. C. D. of 777 and 1998 = 111: $111)\frac{777}{1998} = \frac{7}{18}$, *Ans.*
- (15.) G. C. D. of 909 and 2323 = 101: $101)\frac{909}{2323} = \frac{9}{23}$, *Ans.*
- (16.) $\frac{391}{867}$: G. C. D. = 23: $23)\frac{391}{867} = \frac{17}{29}$, *Ans.*
- (17.) $\frac{585}{1287}$: G. C. D. = 117: $117)\frac{585}{1287} = \frac{5}{11}$, *Ans.*
- (18.) $\frac{796}{14129}$: G. C. D. = 199: $199)\frac{796}{14129} = \frac{4}{71}$, *Ans.*
- (19.) $\frac{1457}{5921}$: G. C. D. = 31: $31)\frac{1457}{5921} = \frac{47}{191}$, *Ans.*
- (20.) $5)\frac{6465}{7335} = \frac{1293}{1467}$, $\div 3 = \frac{431}{489}$, *Ans.*

Art. 108.

$$(2.) \begin{array}{ccc} 2 & 3 & 4 \\ \hline \end{array}$$

1 3 2; $2 \times 3 \times 2 = 12$, L. C. Denominator.
 Each must be changed to twelfths. If there are $\frac{12}{12}$ in 1,
 in $\frac{1}{2}$ there are $\frac{1}{2}$ of $\frac{12}{12} = \frac{6}{12}$: $\frac{1}{3}$ of $\frac{12}{12} = \frac{4}{12}$, and $\frac{2}{3} = \frac{8}{12}$:
 $\frac{1}{4}$ of $\frac{12}{12} = \frac{3}{12}$, and $\frac{3}{4} = \frac{9}{12}$.

(3.) L. C. M. of 3, 6, and 9 is 18; $\frac{1}{3} = \frac{6}{18}$, and $\frac{2}{3} = \frac{12}{18}$: $\frac{1}{6} = \frac{3}{18}$, and $\frac{5}{6} = \frac{15}{18}$: $\frac{1}{9} = \frac{2}{18}$, and $\frac{7}{9} = \frac{14}{18}$.

(4.) The L. C. M. of 2, 4, and 5 = 20; $\frac{1}{2} = \frac{10}{20}$: $\frac{1}{4} = \frac{5}{20}$, and $\frac{3}{4} = \frac{15}{20}$: $\frac{1}{5} = \frac{4}{20}$, and $\frac{4}{5} = \frac{16}{20}$.

(5.) L. C. M. of 8, 5, and 10 = 40: $\frac{1}{8} = \frac{5}{40}$ of $\frac{40}{40} = \frac{5}{40}$, and $\frac{3}{8} = \frac{15}{40}$: $\frac{1}{5} = \frac{8}{40}$ of $\frac{40}{40} = \frac{8}{40}$, and $\frac{4}{5} = \frac{32}{40}$: $\frac{1}{10} = \frac{4}{40}$ of $\frac{40}{40} = \frac{4}{40}$, and $\frac{9}{10} = \frac{36}{40}$.

(6.) The L. C. M. of 3, 4, and 8 is 24; $\frac{1}{3} = \frac{8}{24}$, and $\frac{2}{3} = \frac{16}{24}$: $\frac{1}{4} = \frac{6}{24}$, and $\frac{3}{4} = \frac{18}{24}$: $\frac{1}{8} = \frac{3}{24}$, and $\frac{7}{8} = \frac{21}{24}$.

(7.) L. C. M. of 4, 8, and 9 = 72; $\frac{1}{4} = \frac{18}{72}$, and $\frac{3}{4} = \frac{54}{72}$: $\frac{1}{8} = \frac{9}{72}$, and $\frac{5}{8} = \frac{45}{72}$: $\frac{1}{9} = \frac{8}{72}$, and $\frac{5}{9} = \frac{40}{72}$.

(12.) L. C. M. of 3, 5, 7, and 8 = 840; $\frac{1}{3} = \frac{280}{840}$, and $\frac{2}{3} = \frac{560}{840}$: $\frac{1}{5} = \frac{168}{840}$, and $\frac{2}{5} = \frac{336}{840}$: $\frac{1}{7} = \frac{120}{840}$, and $\frac{3}{7} = \frac{360}{840}$: $\frac{1}{8} = \frac{105}{840}$, and $\frac{5}{8} = \frac{525}{840}$.

(13.) First reduce $\frac{9}{21}$ to lowest terms = $\frac{3}{7}$. L. C. M. of 7, 14, 7, and 28 is 28; $\frac{1}{7} = \frac{4}{28}$, and $\frac{2}{7} = \frac{8}{28}$: $\frac{1}{14} = \frac{2}{28}$, and $\frac{5}{14} = \frac{10}{28}$: $\frac{1}{7} = \frac{4}{28}$, and $\frac{3}{7} = \frac{12}{28}$: $\frac{11}{28}$ is already reduced.

(14.) $\frac{6}{9} = \frac{2}{3}$: $\frac{15}{18} = \frac{5}{6}$; the L. C. M. of 5, 4, 3, and 6 is 60; $\frac{1}{5} = \frac{12}{60}$, and $\frac{2}{5} = \frac{24}{60}$: $\frac{1}{4} = \frac{15}{60}$, and $\frac{3}{4} = \frac{45}{60}$: $\frac{1}{3} = \frac{20}{60}$, and $\frac{2}{3} = \frac{40}{60}$: $\frac{1}{6} = \frac{10}{60}$, and $\frac{5}{6} = \frac{50}{60}$.

(15.) The L. C. M. of 4, 9, and 12 = 36; $1 = \frac{36}{36}$, and $2 = \frac{72}{36}$: $\frac{1}{4} = \frac{9}{36}$, and $\frac{3}{4} = \frac{27}{36}$: $\frac{1}{9} = \frac{4}{36}$, and $\frac{5}{9} = \frac{20}{36}$: $\frac{1}{12} = \frac{3}{36}$, and $\frac{7}{12} = \frac{21}{36}$.

(16.) $2\frac{2}{3} = \frac{8}{3}$: $5\frac{5}{6} = \frac{35}{6}$; L. C. M. of 3, 5, and 6 is 30; $\frac{1}{3} = \frac{10}{30}$, and $\frac{8}{3} = \frac{80}{30}$: $\frac{1}{5} = \frac{6}{30}$, and $\frac{3}{5} = \frac{18}{30}$: $1 = \frac{30}{30}$, and $4 = \frac{120}{30}$: $\frac{1}{6} = \frac{5}{30}$, and $\frac{35}{6} = \frac{175}{30}$.

(17.) $2\frac{1}{2} = \frac{5}{2}$: $3\frac{1}{3} = \frac{10}{3}$: $4\frac{1}{4} = \frac{17}{4}$; L. C. M. of 2, 3, and 4 is 12; $\frac{1}{2} = \frac{6}{12}$, and $\frac{5}{2} = \frac{30}{12}$: $\frac{1}{3} = \frac{4}{12}$, and $\frac{10}{3} = \frac{40}{12}$: $\frac{1}{4} = \frac{3}{12}$, and $\frac{17}{4} = \frac{51}{12}$: $1 = \frac{12}{12}$, and $5 = \frac{60}{12}$.

(18.) L. C. M. of 16, 18, 24, 36, and 48 is 144; $\frac{1}{16} = \frac{9}{144}$, and $\frac{7}{16} = \frac{63}{144}$; $\frac{1}{18} = \frac{8}{144}$, and $\frac{11}{18} = \frac{88}{144}$; $\frac{1}{24} = \frac{6}{144}$, and $\frac{17}{24} = \frac{102}{144}$; $\frac{1}{36} = \frac{4}{144}$, and $\frac{19}{36} = \frac{76}{144}$; $\frac{1}{48} = \frac{3}{144}$, and $\frac{25}{48} = \frac{75}{144}$.

(19.) L. C. M. of 7, 10, 12, 35, 63, and 28 is 1260: $\frac{1}{7} = \frac{180}{1260}$, and $\frac{4}{7} = \frac{720}{1260}$; $\frac{1}{10} = \frac{126}{1260}$, and $\frac{3}{10} = \frac{378}{1260}$; $\frac{1}{12} = \frac{105}{1260}$, and $\frac{5}{12} = \frac{525}{1260}$; $\frac{1}{35} = \frac{36}{1260}$, and $\frac{17}{35} = \frac{612}{1260}$; $\frac{1}{63} = \frac{20}{1260}$, and $\frac{4}{63} = \frac{80}{1260}$; $\frac{1}{28} = \frac{45}{1260}$, and $\frac{15}{28} = \frac{675}{1260}$.

(20.) L. C. M. of 5, 10, 25, 30, 45, and 60 is 900; $\frac{1}{5} = \frac{180}{900}$, and $\frac{3}{5} = \frac{540}{900}$; $\frac{1}{10} = \frac{90}{900}$, and $\frac{7}{10} = \frac{630}{900}$; $\frac{1}{25} = \frac{36}{900}$, and $\frac{2}{25} = \frac{72}{900}$; $\frac{1}{30} = \frac{30}{900}$, and $\frac{11}{30} = \frac{330}{900}$; $\frac{1}{45} = \frac{20}{900}$, and $\frac{13}{45} = \frac{260}{900}$; $\frac{1}{60} = \frac{15}{900}$, and $\frac{23}{60} = \frac{345}{900}$.

Art. 110.

$$(6.) \frac{3}{11} + \frac{7}{11} + \frac{8}{11} + \frac{10}{11} = \frac{28}{11} = 2\frac{6}{11}, \text{ Ans.}$$

$$(7.) \frac{5}{13} + \frac{8}{13} + \frac{9}{13} + \frac{11}{13} = \frac{33}{13} = 2\frac{7}{13}, \text{ Ans.}$$

$$(8.) \frac{7}{15} + \frac{8}{15} + \frac{11}{15} + \frac{13}{15} = \frac{39}{15} = 2\frac{9}{15} = 2\frac{3}{5}, \text{ Ans.}$$

$$(9.) \frac{9}{20} + \frac{11}{20} + \frac{13}{20} + \frac{17}{20} = \frac{50}{20} = 2\frac{10}{20} = 2\frac{1}{2}, \text{ Ans.}$$

$$(10.) \frac{12}{25} + \frac{16}{25} + \frac{18}{25} + \frac{24}{25} = \frac{70}{25} = 2\frac{14}{25} = 2\frac{2}{5}, \text{ Ans.}$$

Art. 111.

(2.) The least common denominator is 6; $\frac{1}{2} = \frac{3}{6}$, $\frac{1}{3} = \frac{2}{6}$: $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$, *Ans.*

(4.) The L. C. D. is 10; $\frac{1}{2} = \frac{5}{10}$, $\frac{3}{5} = \frac{6}{10}$: $\frac{5}{10} + \frac{6}{10} = \frac{11}{10} = 1\frac{1}{10}$, *Ans.*

(8.) $2\frac{1}{2} = \frac{5}{2}$, $3\frac{2}{3} = \frac{11}{3}$; the L. C. D. = 6; $\frac{5}{2} = \frac{15}{6}$, $\frac{11}{3} = \frac{22}{6}$: $\frac{15}{6} + \frac{22}{6} = \frac{37}{6} = 6\frac{1}{6}$, *Ans.*

(9.) L. C. D. = 12; $\frac{2}{3} = \frac{8}{12}$, $\frac{3}{4} = \frac{9}{12}$, $\frac{5}{6} = \frac{10}{12}$: $\frac{8+9+10}{12} = \frac{27}{12} = 2\frac{3}{4} = 2\frac{1}{4}$, *Ans.*

(10.) L. C. D. = 24; $\frac{1}{4} = \frac{6}{24}$, $\frac{7}{8} = \frac{21}{24}$, $\frac{11}{12} = \frac{22}{24}$: $\frac{6+21+22}{24} = \frac{49}{24} = 2\frac{1}{24}$, *Ans.*

$$(11.) \text{ L. C. D. } = 792; \quad \frac{1}{8} = \frac{99}{792}, \quad \frac{1}{9} = \frac{88}{792}, \quad \frac{2}{11} = \frac{144}{792};$$

$$\frac{99+88+144}{792} = \frac{331}{792}, \text{ Ans.}$$

$$(12.) \quad \frac{4}{5} = \frac{16}{20}, \quad \frac{1}{2} = \frac{10}{20}, \quad \frac{3}{4} = \frac{15}{20}; \quad \frac{16}{20} + \frac{10}{20} + \frac{15}{20} = \frac{41}{20} = 2\frac{1}{20};$$

$$7 + 8 + 2\frac{1}{20} = 17\frac{1}{20}, \text{ Ans.}$$

$$(13.) \text{ L. C. D. } = 5460; \quad \frac{1}{12} = \frac{455}{5460}, \quad \frac{1}{13} = \frac{420}{5460}, \quad \frac{1}{14} = \frac{390}{5460},$$

$$\frac{1}{15} = \frac{364}{5460}; \quad \frac{455+420+390+364}{5460} = \frac{1629}{5460} = \frac{543}{1820}, \text{ Ans.}$$

$$(14.) \text{ L. C. D. } = 180; \quad \frac{1}{18} = \frac{10}{180}, \quad \frac{8}{15} = \frac{96}{180}, \quad \frac{1}{20} = \frac{9}{180},$$

$$\frac{1}{30} = \frac{6}{180}; \quad \frac{10+96+9+6}{180} = \frac{121}{180} = 2\frac{1}{180}, \text{ Ans.}$$

(15)

$$\begin{array}{r} \frac{7}{12} \\ 2\frac{5}{6} \\ 3\frac{3}{8} \\ 3\frac{4}{9} \\ \hline 8 \\ 21\frac{7}{2} \\ \hline 104\frac{7}{2}, \text{ Ans.} \end{array} \quad \begin{array}{r} \frac{7}{12} = \frac{42}{72} \\ \frac{5}{6} = \frac{60}{72} \\ \frac{3}{8} = \frac{27}{72} \\ \frac{4}{9} = \frac{32}{72} \\ \hline 161 \\ \frac{161}{72} = 21\frac{7}{2} \end{array}$$

(16)

$$\begin{array}{r} 16\frac{2}{3} \\ 12\frac{3}{4} \\ 8\frac{3}{5} \\ 21\frac{1}{4} \\ \hline 38 \\ 21\frac{4}{5} \\ \hline 40\frac{4}{5}, \text{ Ans.} \end{array} \quad \begin{array}{r} \frac{2}{3} = \frac{40}{60} \\ \frac{3}{4} = \frac{45}{60} \\ \frac{3}{5} = \frac{36}{60} \\ \frac{1}{4} = \frac{15}{60} \\ \hline 136 \\ \frac{136}{60} = 2\frac{4}{15} \end{array}$$

$$(17.) \text{ L. C. D. } = 60; \quad \frac{1}{2} = \frac{30}{60}, \quad \frac{1}{3} = \frac{20}{60}, \quad \frac{1}{4} = \frac{15}{60}, \quad \frac{1}{5} = \frac{12}{60},$$

$$\frac{1}{6} = \frac{10}{60}; \quad \frac{30+20+15+12+10}{60} = \frac{87}{60} = 1\frac{27}{60} = 1\frac{9}{20}, \text{ Ans.}$$

$$(18.) \quad \frac{2}{5} = \frac{1120}{2800}, \quad \frac{7}{16} = \frac{1225}{2800}, \quad \frac{7}{50} = \frac{392}{2800}, \quad \frac{3}{140} = \frac{60}{2800}, \quad \frac{3}{2800};$$

$$\frac{1120+1225+392+60+3}{2800} = \frac{2800}{2800} = 1, \text{ Ans.}$$

$$(19.) \quad \frac{1}{20} = \frac{36}{720}, \quad \frac{7}{16} = \frac{315}{720}, \quad \frac{11}{12} = \frac{660}{720}, \quad \frac{2}{15} = \frac{96}{720}, \quad \frac{11}{18} = \frac{440}{720};$$

$$\frac{36}{720} + \frac{315}{720} + \frac{660}{720} + \frac{96}{720} + \frac{440}{720} = \frac{1547}{720} = 21\frac{7}{20}; \quad 1 + 2 + 21\frac{7}{20} = 51\frac{7}{20}, \text{ Ans.}$$

$$(20.) \quad \frac{2}{3} = \frac{40}{60}, \quad \frac{1}{2} = \frac{30}{60}, \quad \frac{1}{5} = \frac{12}{60}, \quad \frac{1}{3} = \frac{20}{60}, \quad \frac{1}{4} = \frac{15}{60}; \quad \frac{40}{60} + \frac{30}{60}$$

$$+ \frac{12}{60} + \frac{20}{60} + \frac{15}{60} = \frac{117}{60} = 1\frac{57}{60} = 1\frac{19}{20}; \quad 2 + 4 + 6 + 8 + 1\frac{19}{20}$$

$$= 21\frac{19}{20}, \text{ Ans.}$$

$$(21.) \quad \frac{1}{3} = \frac{35}{105}, \quad \frac{2}{7} = \frac{30}{105}, \quad \frac{1}{5} = \frac{21}{105}, \quad \frac{1}{21} = \frac{5}{105}; \quad \frac{35}{105} + \frac{30}{105} +$$

$$\frac{21}{105} + \frac{5}{105} = \frac{91}{105} = \frac{13}{15}; \quad 1 + 4 + 2 + 2 + \frac{13}{15} = 9\frac{13}{15}, \text{ Ans.}$$

Key 8.

Art. 113.

$$(2.) \frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}, \text{ Ans.}$$

(7.) $4\frac{1}{4} - 2\frac{3}{4}$. $\frac{3}{4}$ can not be taken from $\frac{1}{4}$; so borrow 1 from 4. $1 = \frac{4}{4}$; $\frac{4}{4} + \frac{1}{4} = \frac{5}{4}$; $\frac{3}{4}$ from $\frac{5}{4} = \frac{2}{4}$ or $\frac{1}{2}$. Since we took 1 from 4, only 3 remain, and $3 - 2 = 1$. *Ans.* $1\frac{1}{2}$.

$$(8) \quad \begin{array}{r} 8\frac{1}{3} \\ 3\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} \frac{1}{3} + \frac{2}{3} = \frac{3}{3} \\ \frac{4}{3} - \frac{2}{3} = \frac{2}{3} \end{array}$$

$4\frac{2}{3}$, *Ans.*

$$(9) \quad \begin{array}{r} 23\frac{7}{20} \\ 17\frac{11}{20} \\ \hline \end{array} \quad \begin{array}{r} \frac{7}{20} + \frac{20}{20} = \frac{27}{20} \\ \frac{27}{20} - \frac{11}{20} = \frac{16}{20} = \frac{4}{5} \end{array}$$

$5\frac{4}{5}$, *Ans.*

Art. 114.

(9.) L. C. D. = 30; $\frac{4}{15} = \frac{8}{30}$, $\frac{1}{10} = \frac{3}{30}$; $\frac{8}{30} - \frac{3}{30} = \frac{5}{30} = \frac{1}{6}$, *Ans.*

(10.) L. C. D. = 42; $\frac{16}{21} = \frac{32}{42}$, $\frac{5}{14} = \frac{15}{42}$; $\frac{32}{42} - \frac{15}{42} = \frac{17}{42}$, *Ans.*

(12.) $5 = \frac{15}{3}$; $\frac{15}{3} - \frac{2}{3} = \frac{13}{3} = 4\frac{1}{3}$, *Ans.*

(13.) $5\frac{2}{3} = \frac{17}{3} = \frac{34}{6}$, $4\frac{1}{2} = \frac{9}{2} = \frac{27}{6}$; $\frac{34}{6} - \frac{27}{6} = \frac{7}{6} = 1\frac{1}{6}$, *Ans.*

(14.) $7\frac{2}{3} = \frac{23}{3} = \frac{92}{12}$, $4\frac{3}{4} = \frac{19}{4} = \frac{57}{12}$; $\frac{92}{12} - \frac{57}{12} = \frac{35}{12} = 2\frac{11}{12}$, *Ans.*

(15.) $14\frac{1}{4} = \frac{57}{4} = \frac{171}{12}$, $12\frac{2}{3} = \frac{38}{3} = \frac{152}{12}$; $\frac{171}{12} - \frac{152}{12} = \frac{19}{12} = 1\frac{7}{12}$, *Ans.*

(16.) $5\frac{3}{14} = \frac{73}{14} = \frac{219}{42}$, $2\frac{1}{21} = \frac{52}{21} = \frac{104}{42}$; $\frac{219}{42} - \frac{104}{42} = \frac{115}{42} = 2\frac{31}{42}$, *Ans.*

(17.) $4\frac{1}{24} = \frac{97}{24} = \frac{194}{48}$, $3\frac{1}{16} = \frac{49}{16} = \frac{147}{48}$; $\frac{194}{48} - \frac{147}{48} = \frac{47}{48}$, *Ans.*

(18.) $56\frac{1}{3} = \frac{169}{3} = \frac{676}{12}$, $42\frac{1}{4} = \frac{169}{4} = \frac{507}{12}$; $\frac{676}{12} - \frac{507}{12} = \frac{169}{12} = 14\frac{1}{12}$, *Ans.*

(19.) $60\frac{4}{5} = \frac{304}{5} = \frac{608}{10}$, $41\frac{3}{10} = \frac{413}{10}$; $\frac{608}{10} - \frac{413}{10} = \frac{195}{10} = 19\frac{1}{2}$, *Ans.*

(20.) $97\frac{1}{2} = \frac{195}{2} = \frac{585}{6}$, $48\frac{5}{6} = \frac{293}{6}$; $\frac{585}{6} - \frac{293}{6} = \frac{292}{6} = 48\frac{2}{3}$, *Ans.*

Art. 115.

$$(5.) \frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}, \text{ Ans.}$$

$$(6.) 8 \times \frac{2}{3} = \frac{16}{3} = 5\frac{1}{3}, \text{ Ans.}$$

$$(7.) \frac{3}{4} \times \frac{5}{7} = \frac{15}{28}, \text{ Ans.}$$

$$(8.) \frac{2}{3} \times 4 = \frac{8}{3} = 2\frac{2}{3}, \text{ Ans.}$$

$$(9.) 5 \times \frac{3}{4} = \frac{15}{4} = 3\frac{3}{4}, \text{ Ans.}$$

$$(11.) \frac{2}{3} \times 6 = \frac{12}{3} = 4, \text{ Ans.}$$

$$(12.) 20 \times \frac{3}{4} = \frac{60}{4} = 15, \text{ Ans.}$$

$$(13.) \frac{8}{13} \times \frac{11}{16} = \frac{11}{26}, \text{ Ans.}$$

$$(14.) \frac{3}{5} \times 10 = \frac{30}{5} = 6, \text{ Ans.}$$

$$(15.) 12 \times \frac{2}{3} = \frac{24}{3} = 8, \text{ Ans.}$$

$$(16.) \frac{9}{13} \times \frac{3}{7} : \frac{9}{13} \times \frac{3}{7} = \frac{27}{91}, \text{ Ans.}$$

$$(17.) \frac{3}{7} \times 6 = \frac{18}{7} = 2\frac{4}{7}, \text{ Ans.}$$

$$(18.) 7 \times \frac{2}{3} = \frac{14}{3} = 4\frac{2}{3}, \text{ Ans.}$$

$$(21.) 8 \text{ times } 3 = 24 : 8 \text{ times } \frac{2}{3} = \frac{16}{3} = 5\frac{1}{3} : 24 + 5\frac{1}{3} = 29\frac{1}{3}, \text{ Ans.}$$

$$(22.) 2\frac{1}{2} = \frac{5}{2} : \frac{5}{2} \times \frac{5}{2} = \frac{25}{4} = 6\frac{1}{4}, \text{ Ans.}$$

$$(23.) 10 \times 7 = 70 : \frac{7}{9} \times 7 = \frac{49}{9} = 5\frac{4}{9} : 70 + 5\frac{4}{9} = 75\frac{4}{9}, \text{ Ans.}$$

$$(24.) 25 \times 8 = 200 : 25 \times \frac{3}{5} = \frac{75}{5} = 15 : 200 + 15 = 215, \text{ Ans.}$$

$$(25.) \quad \quad \quad 19$$

$$17\frac{3}{11} = \frac{190}{11} : \frac{9}{10} \times \frac{190}{11} = \frac{171}{11} = 15\frac{6}{11}, \text{ Ans.}$$

$$(26.) 10 \times 9 = 90 : \frac{5}{6} \times 9 = \frac{45}{6} = 7\frac{3}{2} = 7\frac{1}{2} : 90 + 7\frac{1}{2} = 97\frac{1}{2}, \text{ Ans.}$$

(27.) 8 times $64 = 512$: $\frac{1}{8}$ of $64 = 8$: $\frac{7}{8} = 56$: $512 + 56 = 568$, *Ans.*

(28.) $8\frac{3}{4} = \frac{35}{4}$: $\frac{1}{7}$ of $\frac{35}{4} = \frac{5}{4}$: $\frac{3}{7} = \frac{15}{4} = 3\frac{3}{4}$, *Ans.*

(29.)
 $2\frac{2}{11} = \frac{24}{11}$: $\frac{5}{12} \times \frac{9}{16} \times \frac{24}{11} = \frac{45}{88}$, *Ans.*

(30.)
 $2\frac{1}{16} = \frac{33}{16}$: $\frac{3}{16} \times \frac{3}{11} \times \frac{16}{9} = 1$, *Ans.*

(31.) $\frac{3}{4} \times \frac{13}{9} \times \frac{21}{1} = \frac{819}{2} = 409\frac{1}{2}$, *Ans.*

(32.)
 $\frac{5}{2} \times \frac{11}{3} \times \frac{19}{4} \times \frac{8}{7} = \frac{1045}{21} = 49\frac{16}{21}$, *Ans.*

(33.)
 $\frac{11}{5} \times \frac{55}{26} \times \frac{13}{4} \times \frac{16}{11} = 22$, *Ans.*

(34.) $\frac{7}{8} \times \frac{3}{10} \times \frac{8}{9} \times \frac{5}{6} \times \frac{2}{3} \times \frac{6}{7} = \frac{1}{9}$, *Ans.*

(35.)
 $\frac{1}{4} \times \frac{9}{7} \times \frac{4}{5} \times \frac{7}{9} \times \frac{5}{4} \times \frac{2}{3} \times \frac{6}{1} = 1$, *Ans.*

$$(36.) \quad \frac{6}{7} \times \frac{4}{9} \times \frac{7}{4} \times \frac{1}{6} \times \frac{3}{4} \times \frac{5}{6} \times \frac{2}{5} \times \frac{20}{1} = \frac{5}{9}, \text{ Ans.}$$

$$(37.) \quad \frac{5}{2} \times \frac{32}{5} \times \frac{13}{4} \times \frac{7}{13} \times \frac{2}{1} \times \frac{3}{7} = 24, \text{ Ans.}$$

Art. 116.

(2.) $\frac{1}{4}$ of 5 = $\frac{5}{4}$; then $\frac{3}{4}$ of 5 = 3 times $\frac{5}{4} = \frac{15}{4} = 3\frac{3}{4}$,
Ans.

(3.) $\frac{2}{5}$ of 7 = $\frac{14}{5} = 2\frac{4}{5}$, *Ans.*

(4.) $\frac{4}{5}$ of 10 = $\frac{40}{5} = 8$, *Ans.*

(5.) $\frac{1}{6}$ of 12 = 2: $\frac{5}{6} = 2 \times 5 = 10$, *Ans.*

(6.) $\frac{5}{6}$ of 15 = $\frac{75}{6} = 12\frac{3}{6} = 12\frac{1}{2}$, *Ans.*

(7.) $\frac{8}{9}$ of 21 = $\frac{168}{9} = 18\frac{6}{9} = 18\frac{2}{3}$, *Ans.*

(8.) $\frac{1}{10}$ of 25 = $\frac{25}{10} = \frac{5}{2}$: $\frac{7}{10} = \frac{35}{2} = 17\frac{1}{2}$, *Ans.*

(9.) $\frac{5}{12}$ of 27 = $\frac{135}{12} = 11\frac{3}{4} = 11\frac{1}{4}$, *Ans.*

(10.) $\frac{7}{12}$ of 28 = $\frac{196}{12} = 16\frac{4}{3} = 16\frac{1}{3}$, *Ans.*

Art. 117.

(4.) $\frac{1}{2}$ of $\frac{3}{5}$ of $\frac{11}{4} = \frac{1}{2} \times \frac{3}{5} \times \frac{11}{4} = \frac{33}{40}$, *Ans.*

(7.) $\frac{2}{3}$ of $\frac{5}{7}$ of $\frac{13}{9} = \frac{2}{3} \times \frac{5}{7} \times \frac{13}{9} = \frac{130}{189}$, *Ans.*

(8.) $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5} = \frac{2}{5}$, *Ans.*

(9.) $\frac{1}{3}$ of $\frac{3}{4}$ of $\frac{5}{6} = \frac{5}{24}$, *Ans.*

(10.) $\frac{3}{5}$ of $\frac{5}{7}$ of $\frac{7}{8} = \frac{3}{8}$, *Ans.*

$$(11.) \quad \frac{\frac{3}{5}}{\frac{3}{5}} \text{ of } \frac{\frac{4}{9}}{\frac{4}{9}} \text{ of } \frac{\frac{7}{12}}{\frac{7}{12}} \text{ of } \frac{\frac{18}{35}}{\frac{18}{35}} = \frac{2}{5}, \text{ Ans.}$$

$$(12.) \quad \frac{1}{\frac{3}{5}} \text{ of } \frac{\frac{3}{4}}{\frac{3}{4}} \text{ of } \frac{4}{9} = \frac{1}{9}, \text{ Ans.}$$

$$(13.) \quad \frac{1}{9} \text{ of } \frac{\frac{3}{4}}{\frac{3}{4}} \text{ of } \frac{4}{\frac{3}{5}} = \frac{1}{9}, \text{ Ans.}$$

$$(14.) \quad \frac{\frac{3}{5}}{\frac{3}{5}} \text{ of } \frac{\frac{6}{7}}{\frac{6}{7}} \text{ of } \frac{\frac{35}{18}}{\frac{35}{18}} = 1, \text{ Ans.}$$

$$(15.) \quad \frac{\frac{3}{7}}{\frac{3}{7}} \text{ of } \frac{\frac{8}{3}}{\frac{8}{3}} \text{ of } \frac{7}{4} = 2, \text{ Ans.}$$

$$(16.) \quad \frac{9}{13} \text{ of } \frac{7}{18} \text{ of } \frac{13}{7} = \frac{1}{2}, \text{ Ans.}$$

$$(17.) \quad \frac{1}{2} \text{ of } \frac{4}{5} \text{ of } \frac{1}{8} \text{ of } \frac{5}{1} = \frac{1}{4}, \text{ Ans.}$$

$$(18.) \quad \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4} \text{ of } \frac{4}{5} \text{ of } \frac{5}{8} \text{ of } \frac{5}{9} \text{ of } \frac{9}{10} = \frac{1}{16}, \text{ Ans.}$$

Art. 118.

$$(1.) \quad 2\frac{1}{3} = \frac{7}{3}, 13\frac{1}{3} = \frac{40}{3} : \frac{7}{3} \times \frac{66}{5} = \frac{154}{5} = 30\frac{4}{5} \text{ ct., Ans.}$$

(2.) 3 times $\frac{2}{3} = \frac{6}{3} = \2 : 5 times $\frac{2}{3} = \frac{10}{3} = \$3\frac{1}{3}$: 7 times $\frac{2}{3} = \frac{14}{3} = \$4\frac{2}{3}$: $\frac{13}{2} \times \frac{2}{3} = \frac{13}{3} = \$4\frac{1}{3}$: $\frac{23}{4} \times \frac{2}{3} = \frac{23}{6} = \$3\frac{5}{6}$.

(3.) $\frac{10}{3} \times \frac{24}{5} = 16$ ct., *Ans.*

(4.) $\frac{16}{5} \times \frac{75}{4} = \60 , *Ans.*

(5.) $\frac{5}{3} \times \frac{3}{20} = \$\frac{1}{4}$, *Ans.*

(6.) $\frac{5}{2} \times \frac{4}{5} = \2 , *Ans.*

(7.) $\frac{50}{9} \times \frac{6}{5} = \frac{20}{3} = \$6\frac{2}{3}$, *Ans.*

(8.) $\frac{11}{2} \times \frac{31}{4} = \frac{341}{8} = 42\frac{5}{8}$ mi., *Ans.*

(9.) $\frac{3}{5}$ of $\frac{2}{3} = \frac{2}{5}$, *Ans.*

(10.) $\frac{2}{9}$ of $\frac{11}{2} = \frac{11}{9}$: $\frac{11}{9} \times \frac{27}{4} = \frac{33}{4} = \$8\frac{1}{4}$, *Ans.*

(11.) $\frac{3}{7} \times \frac{5}{9} \times \frac{33}{2} \times \frac{2}{3} \times \frac{7}{8} \times \frac{15}{1} = \frac{275}{8} = 34\frac{3}{8}$, *Ans.*

(12.) $\frac{2}{3} = \frac{8}{12}$, $\frac{3}{4} = \frac{9}{12}$: $\frac{8}{12} + \frac{9}{12} = \frac{17}{12}$: $\frac{2}{3} \times \frac{3}{4} = \frac{1}{2}$: $\frac{1}{2} = \frac{6}{12}$: $\frac{17}{12} \times \frac{6}{12} = \frac{23}{12} = 1\frac{11}{12}$, *Ans.*

Art. 119.

REMARK.—Pupils are often at a loss to understand, why it is that the quotient of one proper fraction, divided by another, is sometimes a whole number, or greater than unity. The teacher should be careful to explain this subject, by means of familiar examples, such as may be found in "Ray's New Intellectual Arithmetic," Lessons XXXIII—XXXVIII.

It should also be shown, that if we take any dividend, and divide it by different numbers, that as the divisor becomes less, the quotient becomes greater; so that, by making the divisor sufficiently small, the quotient may be made as large as we please. Thus, the quotient of $\frac{1}{2}$ divided by $\frac{1}{4}$ is 2; by $\frac{1}{8}$, is 4; by $\frac{1}{16}$ is 8; by $\frac{1}{4000000}$, is 2000000, etc. It is on this principle, that mathematicians, say, that the quotient of any number, divided by 0, is infinitely large.

$$(6.) \text{ 1 yd. will cost } \frac{1}{4} \text{ of } \$\frac{8}{9} = \$\frac{2}{9}, \text{ Ans.}$$

$$(7.) 3 \div \frac{1}{2} = 3 \times \frac{2}{1} = 6, \text{ Ans.}$$

$$(8.) \frac{9}{10} \div \frac{1}{5} = \frac{9}{10} \times \frac{5}{1} = \frac{9}{2} = 4\frac{1}{2} \text{ yd., Ans.}$$

$$(9.) \text{ One cent will buy } \frac{1}{3} \text{ of an orange: } \frac{1}{2} \text{ cent will buy } \frac{1}{2} \text{ of } \frac{1}{3} = \frac{1}{6}, \text{ Ans.}$$

$$(10.) 6 \div \frac{3}{4} = 6 \times \frac{4}{3} = \frac{24}{3} = 8 \text{ yd., Ans.}$$

$$(11.) \frac{3}{4} \div \frac{1}{5} = \frac{3}{4} \times \frac{5}{1} = \frac{15}{4} = 3\frac{3}{4} \text{ yd., Ans.}$$

$$(12.) \text{ 1 lb. will cost } \frac{1}{7} \text{ of } \$\frac{14}{5} = \$\frac{2}{5}, \text{ Ans.}$$

$$(14.) \quad 2\frac{2}{5} = \frac{12}{5} : \frac{1}{6} \text{ of } \frac{12}{5} = \frac{2}{5}, \text{ Ans.}$$

$$(15.) \quad 5\frac{1}{2} = \frac{11}{2} : \frac{22}{1} \times \frac{2}{11} = 4, \text{ Ans.}$$

$$(16.) \quad \frac{5}{2} \times \frac{8}{1} = 40, \text{ Ans.}$$

$$(17.) \quad \frac{3}{5} \times \frac{1}{8} = \frac{3}{40}, \text{ Ans.}$$

$$(18.) \quad \frac{6}{1} \times \frac{5}{12} = \frac{5}{2} = 2\frac{1}{2}, \text{ Ans.}$$

$$(19.) \quad \frac{19}{4} \times \frac{8}{41} = \frac{38}{41}, \text{ Ans.}$$

$$(20.) \quad \frac{88}{7} \times \frac{1}{11} = \frac{8}{7} = 1\frac{1}{7}, \text{ Ans.}$$

$$(21.) \quad \frac{30}{1} \times \frac{4}{15} = 8, \text{ Ans.}$$

$$(22.) \quad \frac{3}{2} \times \frac{2}{15} = \frac{1}{5}, \text{ Ans.}$$

$$(23.) \quad \frac{11}{3} \times \frac{1}{7} = \frac{11}{21}, \text{ Ans.}$$

$$(24.) \quad \frac{50}{1} \times \frac{7}{31} = \frac{350}{31} = 11\frac{9}{31}, \text{ Ans.}$$

$$(25.) \quad \frac{1}{2} \times \frac{50}{1} = 25, \text{ Ans.}$$

$$(26.) \quad \frac{237}{5} \times \frac{1}{15} = \frac{237}{75} = 3\frac{12}{25} = 3\frac{4}{25}, \text{ Ans.}$$

$$(27.) \quad \frac{56}{1} \times \frac{9}{49} = \frac{504}{49} = 10\frac{2}{7}, \text{ Ans.}$$

$$(28.) \quad \frac{14}{15} \times \frac{1}{21} = \frac{2}{45}, \text{ Ans.}$$

$$(29.) \frac{392}{3} \times \frac{1}{18} = \frac{392}{54} = \frac{196}{27} = 7\frac{7}{27}, \text{ Ans.}$$

$$(31.) \frac{\frac{3}{5}}{\frac{8}{9}} \times \frac{\frac{7}{6}}{\frac{4}{3}} = \frac{112}{135}, \text{ Ans.}$$

$$(32.) \frac{1}{3} \times \frac{41}{8} \times \frac{4}{3} \times \frac{2}{35} = \frac{41}{315}, \text{ Ans.}$$

$$(33.) \frac{\frac{5}{18}}{\frac{6}{5}} \times \frac{\frac{2}{5}}{\frac{123}{10}} \times \frac{5}{1} \times \frac{5}{41} = \frac{5}{6}, \text{ Ans.}$$

$$(34.) \frac{\frac{2}{7}}{\frac{7}{8}} \times \frac{\frac{4}{3}}{\frac{3}{1}} \times \frac{1}{5} = \frac{1}{5}, \text{ Ans.}$$

$$(35.) \frac{\frac{5}{18}}{\frac{6}{5}} \times \frac{\frac{2}{5}}{\frac{123}{10}} \times \frac{5}{1} \times \frac{10}{41} \times \frac{1}{\frac{20}{4}} = \frac{1}{12}, \text{ Ans.}$$

Art. 120.

$$(6.) \frac{3}{4} \times \frac{1}{5} = \frac{3}{20}, \text{ Ans.}$$

$$(7.) \frac{1}{\frac{4}{2}} \times \frac{2}{1} = \frac{1}{2}, \text{ Ans.}$$

$$(9.) \frac{15}{4} \times \frac{1}{5} = \frac{3}{4}, \text{ Ans.}$$

$$(8.) \frac{2}{3} \times \frac{\frac{6}{5}}{2} = \frac{4}{5}, \text{ Ans.}$$

$$(10.) \frac{5}{6} \times \frac{\frac{9}{8}}{2} = \frac{15}{16}, \text{ Ans.}$$

$$(11.) \quad \frac{7}{9} \times \frac{1}{11} = \frac{7}{99}, \text{ Ans.}$$

$$(12.) \quad \frac{3}{21} \times \frac{6}{48} = \frac{9}{10}, \text{ Ans.}$$

Art. 121.

$$(2.) \quad \frac{6}{7} \times \frac{5}{11} = \frac{30}{77}, \text{ Ans.}$$

$$(3.) \quad \frac{2}{3} \times \frac{1}{5} = \frac{2}{15}, \text{ Ans.}$$

$$(4.) \quad \frac{2}{1} \times \frac{3}{11} = \frac{6}{11}, \text{ Ans.}$$

$$(5.) \quad \frac{25}{8} \times \frac{7}{33} = \frac{175}{264}, \text{ Ans.}$$

$$(6.) \quad \frac{7}{3} \times \frac{2}{9} = \frac{14}{27}, \text{ Ans.}$$

$$(7.) \quad \frac{15}{4} \times \frac{8}{45} = \frac{2}{3}, \text{ Ans.}$$

$$(8.) \quad \frac{8}{9} \times \frac{3}{27} = \frac{24}{243} = \frac{4}{81}, \text{ Ans.}$$

$$(9.) \quad \frac{7}{35} \times \frac{2}{45} = \frac{14}{1575}, \text{ Ans.}$$

$$(10.) \quad \frac{47}{6} \times \frac{11}{97} = \frac{517}{582}, \text{ Ans.}$$

Art. 122.

$$(1.) \quad 3\frac{1}{4} \div \frac{1}{2} = \frac{13}{4} \times \frac{2}{1} = \frac{13}{2} = 6\frac{1}{2} \text{ yd.}, \text{ Ans.}$$

$$(2.) \quad 2\frac{3}{10} \div \frac{3}{5} = \frac{23}{10} \times \frac{5}{3} = \frac{23}{6} = 3\frac{5}{6} \text{ lb.}, \text{ Ans.}$$

$$(3.) \quad 42\frac{1}{2} \div 3\frac{3}{4} = \frac{85}{2} \div \frac{15}{4} = \frac{85}{2} \times \frac{4}{15} = \frac{17}{1} \times \frac{2}{3} = \frac{34}{3} = 11\frac{1}{3} \text{ yd.}, \text{ Ans.}$$

$$(4.) \quad 10 \div \frac{3}{8} = \frac{10}{1} \times \frac{8}{3} = \frac{80}{3} = 26\frac{2}{3}, \text{ Ans.}$$

$$(5.) \quad \frac{3}{7} \text{ of } 11\frac{1}{2} = \frac{3}{7} \text{ of } \frac{23}{2} = \frac{9}{14}: 3\frac{3}{7} = \frac{24}{7}: \frac{24}{7} \div \frac{9}{14} = \frac{24}{7} \times \frac{14}{9} = \frac{8}{1} \times \frac{2}{3} = \frac{16}{3} = 5\frac{1}{3}, \text{ Ans.}$$

$$(6.) \quad \frac{4}{11} \text{ of } 27\frac{1}{2} = \frac{4}{11} \text{ of } \frac{55}{2} = 10: \frac{3}{10} \text{ of } 21\frac{1}{4} = \frac{3}{10} \text{ of } \frac{85}{4} = \frac{51}{8}: 10 \div \frac{51}{8} = \frac{10}{1} \times \frac{8}{51} = \frac{80}{51} = 1\frac{29}{51}, \text{ Ans.}$$

$$(7.) \frac{3}{2} \times \frac{3}{7} \times \frac{3}{7} \times \frac{2}{\underset{3}{9}} = \frac{3}{49}, \text{ Ans.}$$

$$(8.) \frac{11\overset{4}{3}}{15} \times \frac{12}{11\overset{3}{3}} \times \frac{19}{\underset{3}{9}} \times \frac{15}{47} \times \frac{5}{4} \times \frac{6}{\underset{3}{5}} = \frac{38}{47}, \text{ Ans.}$$

$$(9.) \frac{1\frac{1}{2}}{\frac{2}{3}} = \frac{3}{2} \times \frac{3}{2} = \frac{9}{4} : \frac{2\frac{2}{5}}{2\frac{1}{6}} = \frac{12}{13} \times \frac{6}{13} = \frac{72}{169} : \frac{9}{4} \div \frac{72}{169} = \frac{9}{4} \times \frac{169}{72} = \frac{1}{4} \times \frac{65}{8} = \frac{65}{32} = 2\frac{1}{32}, \text{ Ans.}$$

$$(10.) \frac{5}{3} \times \frac{2}{5} = \frac{2}{3} : \frac{2}{\underset{33}{7}} \times \frac{7}{\underset{33}{594}} = \frac{2}{33} : \frac{2}{\underset{3}{3}} \times \frac{33}{2} = 11, \text{ Ans.}$$

Art. 123.

(1)	(2)	(3)	(4)	(5)
\$16\frac{1}{16}	\$9\frac{1}{8}	\$50\frac{1}{4}	\$32.31\frac{1}{4}	\$5.81\frac{1}{4}
9\frac{1}{8}	4\frac{7}{16}	27\frac{3}{16}	15.12\frac{1}{2}	1.18\frac{3}{4}
5\frac{7}{16}	0\frac{3}{8}	\$23\frac{1}{16}	\$17.18\frac{3}{4}	\$4.62\frac{1}{2}
21\frac{3}{16}	1\frac{5}{8}			
\$33\frac{7}{16}	\$15\frac{9}{16}			

$$(6.) 12\frac{1}{2} \times 9 = 108 + 4\frac{1}{2} = 112\frac{1}{2} \text{ ct.} = \$1.12\frac{1}{2}, \text{ Ans.}$$

$$(7.) 21 \times 6\frac{1}{4} = 126 + 5\frac{1}{4} = 131\frac{1}{4} \text{ ct.} = \$1.31\frac{1}{4}, \text{ Ans.}$$

$$(8.) \$3.18\frac{3}{4} \times 15 = \$47.70 + \$0.11\frac{1}{4} = \$47.81\frac{1}{4}, \text{ Ans.}$$

$$(9.) 62\frac{1}{2} \times 5\frac{1}{2} = 12\frac{5}{2} \times \frac{11}{2} = \frac{1375}{4} = 343\frac{3}{4} \text{ ct.} = \$3.43\frac{3}{4}, \text{ Ans.}$$

$$(10.) 18\frac{3}{4} = \frac{75}{4} : 12\frac{1}{2} = \frac{25}{2} : \frac{75}{4} \times \frac{25}{2} = \frac{1875}{8} = 234\frac{3}{8} \text{ ct.} = \$2.34\frac{3}{8}, \text{ Ans.}$$

$$(11.) 16\frac{2}{3} = \frac{50}{3} : 13\frac{1}{2} = \frac{27}{2} : \frac{50}{3} \times \frac{27}{2} = 25 \times 9 = 225 \text{ ct.} = \$2.25, \text{ Ans.}$$

$$(12.) \$3.37\frac{1}{2} \times 10\frac{1}{4} = \frac{675}{2} \times \frac{41}{4} = \frac{27675}{8} = 3459\frac{3}{8} \text{ ct.} = \$34.59\frac{3}{8}, \text{ Ans.}$$

$$(13.) 17\frac{2}{3} = \frac{53}{3}: \quad \frac{375}{1} \times \frac{53}{3} = 125 \times 53 = 6625 \text{ ct.} = \$66.25, \text{ Ans.}$$

$$(14.) 225 \div 18\frac{3}{4} = \frac{225}{1} \times \frac{4}{75} = \frac{3}{1} \times \frac{4}{1} = 12 \text{ yd., Ans.}$$

$$(15.) 581\frac{1}{4} \div 37\frac{1}{2} = \frac{2325}{4} \times \frac{2}{75} = \frac{31}{2} \times \frac{1}{1} = 15\frac{1}{2} \text{ bu., Ans.}$$

$$(16.) \$11.56\frac{1}{4} \div 5 = \$2.31\frac{1}{4}, \text{ Ans.}$$

$$(17.) \$31.06\frac{1}{4} \div 7 = \$4.43\frac{3}{4}, \text{ Ans.}$$

$$(18.) 5 \text{ mi.} \times 320 = 1600 \text{ rd.: } 1600 \text{ rd.} \times 16\frac{1}{2} = 26400 \text{ ft.: } 26400 \text{ ft.} \times 12 = 316800 \text{ in., Ans.}$$

$$(19.) 2 \text{ mi.} \times 320 + 2 \text{ rd.} = 642 \text{ rd.: } 642 \text{ rd.} \times 16\frac{1}{2} + 2 \text{ ft.} = 10595 \text{ ft., Ans.}$$

$$(21.) 15875 \text{ ft.} \div 16\frac{1}{2} = 962 \text{ rd. } 2 \text{ ft.: } 962 \text{ rd.} \div 320 = 3 \text{ mi. } 2 \text{ rd. } \text{ Ans. } 3 \text{ mi. } 2 \text{ rd. } 2 \text{ ft.}$$

$$(22.) 142634 \text{ in.} \div 12 = 11886 \text{ ft. } 2 \text{ in.: } 11886 \text{ ft.} \div 3 = 3962 \text{ yd.: } 3962 \text{ yd.} \div 5\frac{1}{2} = 720 \text{ rd. } 2 \text{ yd.: } 720 \text{ rd.} \div 320 = 2 \text{ mi. } 80 \text{ rd. } \text{ Ans. } 2 \text{ mi. } 80 \text{ rd. } 2 \text{ yd. } 2 \text{ in.}$$

$$(23.) 2 \text{ mi.} = 126720 \text{ in.: } 2 \text{ ft. } 8 \text{ in.} = 32 \text{ in.: } 126720 \text{ in.} \div 32 \text{ in.} = 3960, \text{ Ans.}$$

$$(24.) 65 \text{ mi.} = 4118400 \text{ in.: } 9 \text{ ft. } 2 \text{ in.} = 110 \text{ in.: } 4118400 \text{ in.} \div 110 \text{ in.} = 37440, \text{ Ans.}$$

$$(25.) 1 \text{ A.} \times 160 + 136 \text{ sq. rd.} = 296 \text{ sq. rd.: } 296 \text{ sq. rd.} \times 30\frac{1}{4} + 25 \text{ sq. yd.} = 8979 \text{ sq. yd., Ans.}$$

$$(26.) 7506 \text{ sq. yd.} \div 30\frac{1}{4} = 248 \text{ sq. rd. } 4 \text{ sq. yd.: } 248 \text{ sq. rd.} \div 160 = 1 \text{ A. } 88 \text{ sq. rd. } \text{ Ans. } 1 \text{ A. } 88 \text{ sq. rd. } 4 \text{ sq. yd.}$$

$$(27.) 5 \text{ ch. } 15 \text{ l.} = 515 \text{ l.: } 7\frac{92}{100} \text{ in.} = \frac{792}{100} \text{ in.: } \frac{792}{100} \text{ in.} \times 515 = \frac{407880}{100} = 4078\frac{4}{5} \text{ in., Ans.}$$

$$(28.) 40\frac{1}{2} = \frac{81}{2}: \quad \frac{81}{2} \times \frac{32}{1} = 81 \times 16 = 1296 \text{ sq. rd.: } 1296 \text{ sq. rd.} \div 160 = 8 \text{ A. } 16 \text{ sq. rd., Ans.}$$

(29.) $365\frac{1}{4}$ da. $\times 4 = 1461$ da.: 1461 da. $\times 24 = 35064$ hr., *Ans.*

(30.) 914092 hr. $\div 24 = 38087$ da. 4 hr.: 38087 da. $\div 365\frac{1}{4} = 104$ yr. 101 da.: 104 yr. $\div 100 = 1$ cen. 4 yr. *Ans.* 1 cen. 4 yr. 101 da. 4 hr.

(31.) $238545 \div 31 = 7695$ da.: $7695 \div 365\frac{1}{4} = 21$ yr., and 99 quarter days remaining, which, reduced to days, by dividing by 4 , makes $24\frac{3}{4}$ days. *Ans.* 21 yr. $24\frac{3}{4}$ da.

Art. 124.

(3.) $\frac{1}{28}$ lb. $\times 16 = \frac{16}{28} = \frac{4}{7}$ oz., *Ans.*

(4.) $\frac{1}{16}$ lb. $\times 12 = \frac{12}{16} = \frac{3}{4}$ oz., *Ans.*

(5.) $\frac{1}{20}$ rd. $\times 5\frac{1}{2} = \frac{11}{40}$ yd. $\times 3 = \frac{33}{40}$ ft., *Ans.*

(6.) $\frac{7}{1280}$ A. $\times 160 = \frac{7}{8}$ sq. rd., *Ans.*

(7.) $\$ \frac{3}{50} \times 100 = \frac{300}{50} = \frac{6}{1}$ ct., *Ans.*

(8.) $\frac{1}{1584}$ da. $\times 24 = \frac{1}{66}$ hr.: $\frac{1}{66}$ hr. $\times 60 = \frac{60}{66} = \frac{10}{11}$ min., *Ans.*

(9.) $\frac{3}{320}$ bu. $\times 4 = \frac{3}{80}$ pk.: $\frac{3}{80}$ pk. $\times 8 = \frac{3}{10}$ qt.: $\frac{3}{10}$ qt. $\times 2 = \frac{3}{5}$ pt., *Ans.*

Art. 125.

(2.) $\frac{4}{5}$ mi. $\times 320 = \frac{1280}{5}$ rd. = 256 rd., *Ans.*

(3.) $\$ \frac{3}{5} \times 100 = \frac{300}{5}$ ct. = 60 ct., *Ans.*

(4.) $\frac{2}{5}$ mi. $\times 320 = \frac{640}{5}$ rd. = 128 rd., *Ans.*

(5.) $\frac{4}{5}$ lb. $\times 12 = \frac{48}{5}$ oz. = $9\frac{3}{5}$ oz.: $\frac{3}{5}$ oz. $\times 20 = \frac{60}{5}$ pwt. = 12 pwt. *Ans.* 9 oz. 12 pwt.

(6.) $\frac{7}{16}$ T. $\times 20 = \frac{140}{16} = 8\frac{3}{4}$ cwt.; $\frac{3}{4}$ cwt. $\times 100 = \frac{300}{4}$ lb. = 75 lb. *Ans.* 8 cwt. 75 lb.

$$(7.) \frac{5}{8} \text{ A.} \times 160 = \frac{800}{8} \text{ sq. rd.} = 100 \text{ sq. rd., Ans.}$$

$$(8.) \frac{1}{8} \text{ of } 63 \text{ gal.} = 7\frac{7}{8}, \text{ and } \frac{7}{8} = 55\frac{1}{8} \text{ gal.: } \frac{1}{8} \text{ gal.} \times 4 = \frac{4}{8} \text{ or } \frac{1}{2} \text{ qt.: } \frac{1}{2} \text{ qt.} \times 2 = \frac{2}{2} \text{ or } 1 \text{ pt. Ans. } 55 \text{ gal. } 1 \text{ pt.}$$

Art. 126.

$$(2.) \frac{4}{5} \times \frac{1}{8} \times \frac{1}{4} = \frac{1}{40} \text{ bu., Ans.}$$

$$(3.) \frac{4}{5} \times \frac{2}{33} = \frac{8}{165} \text{ rd., Ans. } (16\frac{1}{2} \text{ ft. in a rd.} = \frac{33}{2} \text{ ft.})$$

$$(4.) \frac{3}{80} \times \frac{1}{16} = \frac{3}{1280} \text{ lb., Ans.}$$

$$(5.) \frac{4}{9} \times \frac{1}{100} \times \frac{1}{20} = \frac{1}{4500} \text{ T., Ans.}$$

$$(6.) \frac{3}{5} \times \frac{1}{2} \times \frac{1}{8} \times \frac{1}{4} = \frac{3}{320} \text{ bu., Ans.}$$

$$(7.) \frac{4}{7} \times \frac{1}{16} \times \frac{1}{100} = \frac{1}{2800} \text{ cwt., Ans.}$$

$$(8.) \frac{\frac{3}{4}}{2} \times \frac{1}{12} \times \frac{\frac{2}{33}}{11} = \frac{1}{264} \text{ rd., Ans.}$$

$$(9.) \frac{\frac{8}{9}}{3} \times \frac{1}{60} \times \frac{1}{24} = \frac{1}{1620} \text{ da., Ans.}$$

$$(10.) \frac{5}{112} \times \frac{1}{16} \times \frac{1}{100} = \frac{1}{35840} \text{ cwt., Ans.}$$

Art. 127.

$$(2.) 2 \text{ ft. } 6 \text{ in.} = 30 \text{ in.: } 6 \text{ ft. } 8 \text{ in.} = 80 \text{ in.: } \frac{30}{80} = \frac{3}{8}, \text{ Ans.}$$

$$(3.) 2 \text{ pk. } 4 \text{ qt.} = 20 \text{ qt.: } 1 \text{ bu.} = 32 \text{ qt.: } \frac{20}{32} = \frac{5}{8}, \text{ Ans.}$$

$$(4.) \quad 2 \text{ yd. } 9 \text{ in.} = 81 \text{ in.}; \quad 8 \text{ yd. } 2 \text{ ft. } 3 \text{ in.} = 315 \text{ in.};$$

$$\frac{81}{315} = \frac{9}{35}, \text{ Ans.}$$

$$(5.) \quad 13 \text{ hr. } 30 \text{ min.} = 810 \text{ min.}; \quad 1 \text{ da.} \times 24 \times 60 = 1440$$

$$\text{min.}; \quad \frac{810}{1440} = \frac{9}{16}, \text{ Ans.}$$

$$(6.) \quad \frac{145}{320} = \frac{29}{64}, \text{ Ans.}$$

$$(7.) \quad 2 \text{ ft. } 8 \text{ in.} = 32 \text{ in.}; \quad 1 \text{ yd.} = 36 \text{ in.}; \quad \frac{32}{36} = \frac{8}{9}, \text{ Ans.}$$

$$(8.) \quad 15 \text{ mi. } 123 \text{ rd.} = 4923 \text{ rd.}; \quad 35 \text{ mi. } 287 \text{ rd.} = 11487$$

$$\text{rd.}; \quad \frac{4923}{11487} = \frac{3}{7}, \text{ Ans.}$$

$$(9.) \quad 37 \text{ A. } 94 \text{ sq. rd.} = 6014 \text{ sq. rd.}; \quad 168 \text{ A. } 28 \text{ sq. rd.} =$$

$$26908 \text{ sq. rd.}; \quad \frac{6014}{26908} = \frac{97}{434}, \text{ Ans.}$$

$$(10.) \quad 4$$

$$\frac{64}{9} \text{ oz.} \times \frac{1}{16} = \frac{4}{9}, \text{ Ans.}$$

$$(11.) \quad 2 \text{ qt. } 1\frac{1}{3} \text{ pt.} = 5\frac{1}{3} \text{ or } 1\frac{1}{3} \text{ pt.}; \quad 1 \text{ bu. } 1 \text{ qt. } 1\frac{2}{3} \text{ pt.} =$$

$$67\frac{2}{3} \text{ or } 20\frac{2}{3} \text{ pt.}; \quad \frac{16}{3} \times \frac{3}{203} = \frac{16}{203}, \text{ Ans.}$$

$$(12.) \quad 1 \text{ yd. } 1 \text{ ft. } 1\frac{9}{11} \text{ in.} = 49\frac{9}{11} \text{ in.} = \frac{548}{11}; \quad 3 \text{ yd. } 2 \text{ ft. } 8\frac{6}{7}$$

$$\text{in.} = 140\frac{6}{7} = \frac{986}{7}; \quad \frac{548}{11} \times \frac{7}{986} = \frac{3836}{10890} = \frac{1918}{5445}, \text{ Ans.}$$

Art. 128.

$$(3)$$

	hr.	min.
$\frac{2}{3}$ da.	= 16	0
$\frac{3}{4}$ hr.	=	45
Ans.	16	45

$$(4)$$

	da.	hr.	min.
$\frac{1}{4}$ wk.	= 1	18	0
$\frac{1}{4}$ da.	=	6	0
$\frac{1}{4}$ hr.	=		15
Ans.	2	0	15

$$\begin{array}{r}
 \text{(5)} \\
 \text{da. hr. min. sec.} \\
 \frac{2}{3} \text{ wk.} = 4 \quad 16 \quad 0 \quad 0 \\
 \frac{5}{9} \text{ da.} = \quad 13 \quad 20 \quad 0 \\
 \frac{2}{3} \text{ hr.} = \quad \quad 40 \quad 0 \\
 \frac{2}{3} \text{ min.} = \quad \quad \quad 40 \\
 \hline
 \text{Ans. } 5 \quad 6 \quad 0 \quad 40
 \end{array}$$

$$\begin{array}{r}
 \text{(6)} \\
 \text{qt. pt. gi.} \\
 \frac{11}{12} \text{ gal.} = 3 \quad 1 \quad \frac{11}{3} \\
 \frac{1}{12} \text{ qt.} = \quad 0 \quad \frac{2}{3} \\
 \hline
 \text{Ans. } 3 \quad 1 \quad 2
 \end{array}$$

$$\begin{array}{r}
 \text{(7)} \\
 \text{hr. min. sec.} \\
 \frac{7}{9} \text{ da.} = 18 \quad 40 \quad 0 \\
 \frac{1}{18} \text{ hr.} = \quad \quad 3 \quad 20 \\
 \hline
 \text{Ans. } 18 \quad 36 \quad 40
 \end{array}$$

$$\begin{array}{r}
 \text{(8)} \\
 \text{ct.} \\
 \$ \frac{5}{8} = 62\frac{1}{2} \\
 \$ \frac{3}{40} = 7\frac{1}{2} \\
 \hline
 \text{Ans. } 55
 \end{array}$$

$$(9.) \frac{3}{8} \text{ lb.} = 6 \text{ oz.} : 6 \text{ oz.} - \frac{7}{8} \text{ oz.} = 5\frac{1}{8} \text{ oz., Ans.}$$

$$\begin{aligned}
 (10.) \quad & \frac{1}{7} \text{ da.} = 24 \text{ hr.} : \frac{24}{7} - \frac{6}{7} = \frac{18}{7} = 24 \text{ hr.} : \frac{4}{7} \text{ hr.} \times 60 \\
 & = 24\frac{0}{7} \text{ or } 34\frac{2}{7} \text{ min.} : \frac{2}{7} \text{ min.} \times 60 = \frac{120}{7} \text{ or } 17\frac{1}{7} \text{ sec.} \quad \text{Ans.} \\
 & 2 \text{ hr. } 34 \text{ min. } 17\frac{1}{7} \text{ sec.}
 \end{aligned}$$

PROMISCUOUS EXAMPLES.

Art. 129.

$$(1.) \frac{32989}{56981} = \frac{2999 \times 11}{2999 \times 19} = \frac{11}{19}, \text{ Ans.}$$

$$(2.) \quad 2 + 3 = 5 : \frac{1}{2} + \frac{2}{3} + \frac{5}{14} + \frac{8}{21} = \frac{21}{42} + \frac{28}{42} + \frac{15}{42} + \frac{16}{42} = \frac{80}{42} = \frac{40}{21} = 1\frac{19}{21} : 5 + 1\frac{19}{21} = 6\frac{19}{21}, \text{ Ans.}$$

$$(3.) \quad \frac{25}{7} = \frac{125}{35} : \frac{9}{5} = \frac{63}{35} : \frac{125-63}{35} = \frac{62}{35} = 1\frac{27}{35}, \text{ Ans.}$$

$$(4.) \quad 3\frac{5}{8} = \frac{29}{8} : \frac{1}{3} \text{ of } 3\frac{1}{2} = \frac{1}{3} \text{ of } \frac{7}{2} = \frac{7}{6} : \frac{29}{8} - \frac{7}{6} = \frac{87}{24} - \frac{28}{24} = \frac{59}{24} = 2\frac{11}{24}, \text{ Ans.}$$

$$\begin{aligned}
 (5.) \quad & \frac{5}{9} \text{ of } \frac{7}{10} = \frac{7}{18} : \frac{2}{5} \text{ of } \frac{7}{12} = \frac{7}{30} : \frac{7}{18} + \frac{7}{30} = \frac{35}{90} + \frac{21}{90} \\
 & \quad \quad \quad 2 \qquad \qquad \quad 6 \qquad \qquad \quad = \frac{56}{90} = \frac{28}{45}, \text{ Ans.}
 \end{aligned}$$

Key 9.

(6.)

$$1\frac{3}{4} \div 2\frac{1}{2} = \frac{7}{4} \times \frac{2}{5} = \frac{7}{10} : 5\frac{1}{2} \div 3\frac{1}{8} = \frac{11}{2} \times \frac{8}{25} = \frac{44}{25} :$$

$$\frac{7}{10} + \frac{44}{25} = \frac{35}{50} + \frac{88}{50} = \frac{123}{50} = 2\frac{23}{50}, \text{ Ans.}$$

$$(7.) 10 \times \frac{3}{5} = \frac{30}{5} = 6, \text{ Ans.}$$

$$(8.) 10 \div \frac{3}{5} = 10 \times \frac{5}{3} = \frac{50}{3} = 16\frac{2}{3}, \text{ Ans.}$$

(9.) Any number less $\frac{3}{7} = \frac{4}{7}$: then 16 is $\frac{4}{7}$ of the number: 4 is $\frac{1}{7}$, and 28 is $\frac{7}{7}$, the number.

(10.) Any number plus $\frac{3}{7} = \frac{10}{7}$: then $20 = \frac{10}{7}$: $\frac{1}{7} = \frac{1}{10}$ of $20 = 2$: $\frac{7}{7} = 14$, the number.

(11.) $\frac{1}{3}$ of $\frac{5}{8} = \frac{5}{24}$, and $\frac{5}{8} - \frac{5}{24} = \frac{15}{24} - \frac{5}{24} = \frac{10}{24} = \frac{5}{12}$, part left.

Or, the part left may be found thus: If he sell $\frac{1}{3}$ of his share, he has $\frac{2}{3}$ of it left, and $\frac{2}{3}$ of $\frac{5}{8} = \frac{10}{24} = \frac{5}{12}$. $\frac{5}{12}$ of \$900 = $\frac{4500}{12} = \$375$, Ans.

(12.) I sell $\frac{1}{3}$ of $\frac{7}{12}$ of the ship = $\frac{7}{36}$ of the ship for \$1944 $\frac{4}{9}$; at that rate, $\frac{1}{36}$ of the ship is worth $\frac{1}{7}$ of \$1944 $\frac{4}{9}$ = \$277 $\frac{4}{9}$, and $\frac{36}{36}$ is worth 36 times \$277 $\frac{4}{9}$ = \$10000.

$$(13.) \frac{2}{3} \text{ of } 2 = \frac{4}{3} = 1\frac{1}{3} : \frac{1\frac{1}{3}}{3} = \frac{4}{3} \times \frac{1}{3} = \frac{4}{9}, \text{ Ans.}$$

$$(14.) \frac{176}{368} = \frac{16 \times 11}{16 \times 23} = \frac{11}{23}, \text{ Ans.}$$

$$(15.) \frac{1}{8} + \frac{1}{18} + \frac{1}{111} = \frac{333}{2664} + \frac{148}{2664} + \frac{24}{2664} = \frac{793}{2664} : \frac{25}{37} = \frac{793}{2664} = \frac{1800}{2664} - \frac{793}{2664} = \frac{1007}{2664}, \text{ Ans.}$$

(16.)

$$4\frac{9}{14} = 6\frac{5}{14} : \frac{3}{10} \text{ of } \frac{7}{12} \text{ of } \frac{65}{14} = \frac{13}{16} : 1 - \frac{13}{16} = \frac{3}{16}, \text{ Ans.}$$

$$(17.) \frac{2}{3} \div \frac{5}{7} = \frac{2}{3} \times \frac{7}{5} = \frac{14}{15} : \frac{5}{8} \div \frac{10}{11} = \frac{5}{8} \times \frac{11}{10} = \frac{11}{16} : \frac{14}{15} - \frac{11}{16} = \frac{224}{240} - \frac{165}{240} = \frac{59}{240}, \text{ Ans.}$$

(18.) In $\frac{1}{15}$ of an hour he walks $\frac{1}{4}$ of 2044 rd., which is 292 rd.: $\frac{114}{15} = \frac{29}{15}$: in $\frac{29}{15}$ hr. he will walk 29 times 292 rd. = 8468 rd., *Ans.*

$$(19.) 1\frac{1}{4} \text{ ft.} = 15 \text{ in.} = \frac{45}{3} : 3\frac{1}{3} = \frac{10}{3} : \frac{10}{45} = \frac{2}{9}, \text{ Ans.}$$

$$(20.) 3\frac{1}{5} + 3\frac{2}{3} = \frac{16}{5} + \frac{11}{3} = \frac{48}{15} + \frac{55}{15} = \frac{103}{15}. \text{ Ans. } \frac{48}{103} \text{ and } \frac{55}{103}.$$

(21.) $\frac{5}{8}$ of \$2400 = \$1500: \$1500 + \$500 = \$2000. If $\frac{5}{4}$ of B's money = \$2000, $\frac{1}{4}$ is $\frac{1}{5}$ of \$2000, which is \$400, and the whole will be 4 times \$400, which are \$1600, *Ans.*

(22.) If \$2200 are $\frac{5}{12}$ of the elder one's share, $\frac{1}{12}$ is \$440, and $\frac{12}{12}$, the elder one's share = \$5280; if \$5280 are $\frac{16}{35}$ of the whole estate, $\frac{1}{35}$ is \$330, and $\frac{35}{35} = $11550; $2200 + $5280 = $7480; $11550 - $7480 = $4070; each daughter had $\frac{1}{3}$ of $4070 = $1356 $\frac{2}{3}$, *Ans.*$

PRACTICE.

Art. 130.

$$(3.) 12\frac{1}{2} = \frac{25}{2} : 18\frac{3}{4} \text{ ct.} = \frac{3}{16} : \frac{25}{2} \times \frac{3}{16} = \frac{75}{32} = \$2.34\frac{3}{8}, \text{ Ans.}$$

$$(4.) \quad \begin{array}{cc} 3 & 4 \\ \$2.25 = \$2\frac{1}{4} = \frac{9}{4} \times \frac{16}{3} = 12 \text{ yd., Ans.} \end{array}$$

$$(5.) \frac{11}{2} \times \frac{5}{8} = \frac{55}{16} : \$\frac{1}{16} = 6\frac{1}{4} \text{ ct.; } \$\frac{55}{16} = \$3.43\frac{3}{4}, \text{ Ans.}$$

(6.)

$$\begin{array}{r} 53 \\ \$66.25 = \frac{265}{4} : \$3.75 = 3\frac{3}{4} = \frac{15}{4} : \frac{265}{4} \times \frac{4}{15} = \frac{53}{3} \\ = 17\frac{2}{3} \text{ doz., Ans.} \end{array}$$

(7.)

$$\begin{array}{r} 10 \\ \$2.37\frac{1}{2} = 2\frac{3}{8} = \frac{19}{8} : \frac{19}{8} \times \frac{80}{1} = \$190, \text{ Ans.} \end{array}$$

$$(8.) \$4.87\frac{1}{2} = 4\frac{7}{8} = \frac{39}{8} : \frac{39}{1} \times \frac{8}{39} = 8 \text{ men, Ans.}$$

(9.)

$$\begin{array}{r} 12 \\ \$8.33\frac{1}{3} = 8\frac{1}{3} = \frac{25}{3} : \frac{25}{3} \times \frac{36}{1} = \$300, \text{ Ans.} \end{array}$$

$$(10.) \$246.66\frac{2}{3} = 246\frac{2}{3} = \frac{740}{3} : \$1.33\frac{1}{3} = 1\frac{1}{3} = \frac{4}{3} : \frac{740}{3} \times \frac{3}{4} = 185 \text{ yd., Ans.}$$

(12.)

$$\begin{array}{r} 275 \\ \$18\frac{1}{3} = \frac{55}{3} : \$229\frac{1}{6} = \frac{1375}{6} : \frac{1375}{6} \times \frac{3}{55} = \frac{275}{2} = 12\frac{1}{2}, \text{ Ans.} \end{array}$$

$$(13.) 120 \text{ sq. rd.} = \frac{3}{4} \text{ A. } \$125.60 \times 11 = \$1381.60 = \text{cost of 11 A.: } \frac{3}{4} \text{ of } \$125.60 = \$94.20 = \text{cost of 120 sq. rd.: } \$1381.60 + \$94.20 = \$1475.80, \text{ Ans.}$$

(14.)

$$\begin{array}{l} \frac{10000}{250} = 40 \text{ lots. } 50 \text{ ft.} \times 150 \text{ ft.} = 7500 \text{ sq. ft.:} \\ 7500 \text{ sq. ft.} \times 40 = 300000 \text{ sq. ft., } \div 9 = 33333 \text{ sq. yd.} + 3 \\ \text{sq. ft.: } 33333 \text{ sq. yd.} \div 30\frac{1}{4} = 1101 \text{ sq. rd.} + 27\frac{3}{4} \text{ sq. yd.:} \\ \frac{3}{4} \text{ sq. yd.} = \frac{27}{4} \text{ sq. ft.} = 6 \text{ sq. ft.} + \frac{3}{4}; \frac{3}{4} \text{ sq. ft.} \times 144 = 108 \\ \text{sq. in.; } 6 \text{ sq. ft.} + 3 \text{ sq. ft.} = 9 \text{ sq. ft.} = 1 \text{ sq. yd., which} \\ \text{added to } 27 = 28 \text{ sq. yd.: } 1101 \text{ sq. rd.} \div 160 = 6 \text{ A. } 141 \\ \text{sq. rd. } \text{Ans. } 6 \text{ A. } 141 \text{ sq. rd. } 28 \text{ sq. yd. } 108 \text{ sq. in.} \end{array}$$

$$(15.) \quad 2 \text{ qt.} = \frac{1}{4} \text{ pk.} = \frac{1}{16} \text{ bu.}; \quad 3 \text{ pk.} = \frac{3}{4} \text{ or } \frac{12}{16} \text{ bu.}; \quad \$6.20 \\ = \$6\frac{1}{5} = \frac{31}{5}; \quad 83\frac{13}{16} = \frac{1341}{16}, \times \frac{31}{5} = \frac{41571}{80} = \$519.63\frac{3}{4}, \text{ Ans.}$$

$$(16.) \quad 167\frac{1}{2} = \frac{335}{2}; \quad \frac{335}{2} \times \frac{4}{3} = \frac{670}{3} = 223\frac{1}{3} \text{ bu.}; \quad \frac{1}{3} \text{ bu.} = \frac{4}{3} \\ \text{or } 1\frac{1}{3} \text{ pk.}; \quad \frac{1}{3} \text{ pk.} = \frac{8}{3} \text{ or } 2\frac{2}{3} \text{ qt.}; \quad \frac{2}{3} \text{ qt.} = \frac{4}{3} \text{ or } 1\frac{1}{3} \text{ pt.} \quad \text{Ans.} \\ 223 \text{ bu. } 1 \text{ pk. } 2 \text{ qt. } 1\frac{1}{3} \text{ pt.}$$

$$(17.) \quad \$1.75 = 1\frac{3}{4} \text{ or } \frac{7}{4}; \quad \frac{7}{2} \times \frac{7}{4} = \frac{49}{8} = \$6.12\frac{1}{2}, \text{ Ans.}$$

$$(18.) \quad \$1.50 = \frac{3}{2}; \quad \$7.12\frac{1}{2} = \frac{57}{8}; \quad \frac{57}{8} \times \frac{2}{3} = \frac{19}{4} = 4\frac{3}{4} \text{ yd.}, \text{ Ans.}$$

$$(19.) \quad 12 \text{ oz.} = \frac{12}{16} \text{ or } \frac{3}{4} \text{ lb.}; \quad 45\frac{3}{4} \text{ lb.} = \frac{183}{4}; \quad \frac{183}{4} \times \frac{3}{8} = \\ \frac{549}{8} = \$17.15\frac{5}{8}, \text{ Ans.}$$

$$(20.) \quad \$0.93\frac{3}{4} = \left\{ \begin{array}{l} 87\frac{1}{2} = \frac{7}{8} = \frac{14}{16} \\ 6\frac{1}{4} = \frac{1}{16} \end{array} \right\} = \frac{15}{16}; \quad \$2\frac{15}{16} = \$2\frac{47}{16}; \\ \frac{47}{16} \times \frac{8}{1} = \frac{47}{2} = 23\frac{1}{2} \text{ lb.}, \text{ Ans.}$$

$$(21.) \quad 2 \text{ T. } 9 \text{ cwt.} = 49 \text{ cwt.}; \quad 37\frac{1}{2} \text{ ct. per lb.} = \$37\frac{1}{2} \\ \text{per cwt.}; \quad \frac{49}{1} \times \frac{75}{2} = \$1837.50, \text{ Ans.}$$

$$(22.) \quad \$3.90 = 3\frac{9}{10} = \frac{39}{10}; \quad \frac{100}{12} \times \frac{13}{10} = \$32.50, \text{ Ans.}$$

$$(23.) \quad 3\frac{3}{4} = \frac{15}{4}; \quad \$5.40 = 5\frac{4}{10} = \frac{54}{10}; \quad \frac{15}{4} \times \frac{54}{10} = \$20.25, \text{ Ans.}$$

(24.)

$$\begin{array}{r}
 \begin{array}{c} 2 \\ 4 \end{array} \\
 \frac{13}{2} \times \frac{1}{3} \times \frac{12}{1} \text{ (1 doz.)} = \$26. \\
 \frac{7.5}{2} \times \frac{3}{8} = \frac{22.5}{16} = \$14.06\frac{1}{4}
 \end{array}
 \left. \vphantom{\begin{array}{c} 2 \\ 4 \end{array}} \right\} = \$40.06\frac{1}{4}:$$

$$\$40.06\frac{1}{4} - \$36 = \$4.06\frac{1}{4} = \$4\frac{1}{16} = \$\frac{65}{16}: \frac{65}{16} \times \frac{8}{1} = \frac{65}{2} =$$

$$32\frac{1}{2} \text{ lb., Ans.} \quad \quad \quad 2$$

DECIMAL FRACTIONS.

Art. 135.

REMARKS.—Pupils must have a thorough knowledge of common fractions, before they can understand fully the reason of the rules in decimals.

When a pupil is in doubt with regard to the accuracy of the result in any operation involving decimals, let him convert the decimals into common fractions, and then perform the work; the results in both cases ought to be the same.

It is a useful exercise to perform the same operations in equivalent common and decimal fractions. Thus, they may be required to perform the operations indicated in the following examples, by the rules for common fractions; then to convert the common fractions into decimals, and work by the rules for decimals.

(5.) .26	(16.) .00009
(6.) .35	(17.) .900
(7.) .87	(18.) .00605
(8.) 4.19	(19.) .20304
(9.) .905	(20.) .000007
(10.) .054	(21.) .000203
(11.) .304	(22.) .300004
(12.) 7.293	(23.) .0000024
(13.) 25.047	(24.) .0080006
(14.) .0205	(25.) .000200
(15.) .4125	(26.) .00000002

(27.) .00000907	(37.) .001000005
(28.) .20020003	(38.) .0000000202
(29.) 1.010100	(39.) 200.0000000002
(30.) .01010001	(40.) 65.006005
(31.) 106.037	(41.) .3 .7 .09 .17 .23
(32.) 1000.001	.41 .53
(33.) .225	(42.) .87 .97 .123. .289
(34.) 200.025	.487 .733
(35.) .002929	(43.) .003 .0101 .00053
(36.) 2900.000029	.000503

Art. 136.

(4.) Twenty-eight *thousandths*; three hundred and forty-one *thousandths*; two and three hundred and twenty-seven *thousandths*; fifty and five *thousandths*; one hundred and eighty-four and one hundred and seventy-three *thousandths*.

(5.) Three *ten-thousandths*; six hundred and twenty-five *ten-thousandths*; two thousand three hundred and seventy-four *ten-thousandths*; two thousand and six *ten-thousandths*; one hundred and four *ten-thousandths*.

(6.) Three and two hundred and five *ten-thousandths*; eight hundred and ten and two thousand four hundred and six *ten-thousandths*; ten thousand seven hundred and twenty and nine hundred and five *ten-thousandths*.

(7.) Four *hundred-thousandths*; one hundred and thirty-seven *hundred-thousandths*; two thousand three hundred and seventy-six *hundred-thousandths*; one thousand and seven *hundred-thousandths*.

(8.) One thousand seven hundred and sixty-eight *millionths*; forty thousand and thirty-five *millionths*; seventy and three hundred and sixty thousand and four *millionths*.

(9.) One million ten thousand one hundred and one *ten-millionths*; forty thousand and five *hundred-millionths*; one hundred thousand three hundred and four *hundred-millionths*.

(10.) Thirty-one thousand four hundred and fifty-six *hundred-thousandths*; one hundred and thirty-three *millionths*; sixty and four *hundredths*; forty-five and one thousand and three *ten-thousandths*.

(11.) Three hundred and fifty-seven and seventy-five *hundredths*; four thousand nine hundred and twenty-eight *ten-thousandths*; five and nine hundred and forty-five *thousandths*; six hundred and eighty-one and two *ten-thousandths*.

(12.) Seventy and one million two hundred thousand seven hundred and sixty-four *ten-millionths*; nine hundred and fifty-four and two hundred and three *thousandths*; thirty-eight and twenty-seven *thousandths*.

(13.) One thousand and seven and three thousand one hundred and fifty-four *ten-thousandths*; seven thousand four hundred and ninety-six and thirty-five million four hundred and ninety-one thousand seven hundred and sixty-eight *hundred-millionths*.

(14.) Seven hundred and fifteen *hundred-thousandths*; three and five *hundred-thousandths*; twenty-eight and ten million sixty-five thousand seven hundred and one *hundred-millionths*.

(15.) Thirteen and eight trillion two hundred and forty-one billion ninety-four million seven hundred and ten thousand nine hundred and forty-seven *ten-quadrillionths*.

$$(16.) \frac{9}{10}; \frac{13}{100}; \frac{19}{100}; \text{ etc.}$$

$$(17.) \frac{91}{100}; \frac{347}{1000}; \frac{513}{1000}; \text{ etc.}$$

$$(18.) \frac{7}{1000}; \frac{207}{10000}; \frac{79}{100000}; \frac{1007}{1000000}.$$

$$(19.) 1\frac{36}{100}; \frac{3421}{10000}; \frac{3401}{100000}; \frac{900}{100000}.$$

$$(20.) \frac{1}{1000}; \frac{5302}{100000}; 8\frac{1}{100}; \frac{53}{1000000}.$$

Art. 141.

$$(2.) .6 = \frac{6}{10} = \frac{3}{5}, \text{ Ans.} \quad (3.) .25 = \frac{25}{100} = \frac{1}{4}, \text{ Ans.}$$

$$(4.) .375 = \frac{375}{1000} = \frac{3}{8}, \text{ Ans.}$$

$$(5.) .035 = \frac{35}{1000} = \frac{7}{200}, \text{ Ans.}$$

$$(6.) .5625 = \frac{5625}{10000} = \frac{9}{16}, \text{ Ans.}$$

$$(7.) .34375 = \frac{34375}{100000} = \frac{11}{32}, \text{ Ans.}$$

$$(8.) .1484375 = \frac{1484375}{10000000} = \frac{19}{128}, \text{ Ans.}$$

$$(9.) 4.02 = 4\frac{2}{100} = 4\frac{1}{50}, \text{ Ans.}$$

$$(10.) 8.415 = 8\frac{415}{1000} = 8\frac{83}{200}, \text{ Ans.}$$

Art. 142.

$$(2.) \frac{4}{5} = \frac{40}{50} = .8, \text{ Ans.} \quad (3.) \frac{5}{8} = \frac{500}{800} = .625, \text{ Ans.}$$

$$(4.) \frac{7}{25} = \frac{700}{2500} = \frac{140}{500} = .28, \text{ Ans.}$$

$$(5.) \frac{3}{40} = \frac{3000}{40000} = .075, \text{ Ans.}$$

$$(6.) \frac{15}{16} = \frac{150000}{160000} = .9375, \text{ Ans.}$$

$$(7.) \frac{1}{1250} = \frac{10000}{12500000} = .0008, \text{ Ans.}$$

$$(8.) \frac{9}{400} = \frac{90000}{4000000} = .0225, \text{ Ans.}$$

$$(9.) \frac{1}{256} = \frac{100000000}{25600000000} = .00390625, \text{ Ans.}$$

$$(10.) \frac{5}{6} = \frac{50000}{60000} = .8333+, \text{ Ans.}$$

$$(11.) \frac{1}{11} = \frac{10000000}{110000000} = .090909+, \text{ Ans.}$$

$$(12.) \frac{4}{33} = \frac{40000000}{330000000} = .121212+, \text{ Ans.}$$

Art. 143.

(2)	(3)	(4)	(5)
37.1065	4.0004	3.25	21.611
432.07	28.035	6.4	6888.32
4.20733	8.07	.35	3.4167
<u>11.706</u>	<u>.09404</u>	<u>10.00</u>	<u>6913.3477</u>
485.08983	40.19944		

(6)	(7)	(8)	(9)
6.61	4.8	45.019	432.432
636.1	43.31	7.00071	61.0793
6516.14	74.019	93.4327	100.07794
67.1234	11.204	6.0401	6.009
<u>5.1233</u>	<u>133.333</u>	<u>151.49251</u>	<u>1000.1001</u>
7231.0967			1599.69834

(10)	(11)	(12)
16.041	204.0009	.0035
9.000094	103.00000009	.00035
33.27	42.009099	.000035
8.969	430.99	.0000035
<u>32.719906</u>	<u>220.0000009</u>	<u>.0038885</u>
100.000000	999.99999999	

Art. 144.

(2)	(3)	(4)	(5)
97.5168	20.014	5.03	24.0042
38.25942	7.0021	2.115	13.7013
<u>59.25738</u>	<u>13.0119</u>	<u>2.915</u>	<u>10.3029</u>

(6)	(7)	(8)	(9)
170.0035	.0142	.05	13.5
<u>68.00181</u>	<u>.005</u>	<u>.0024</u>	<u>8.037</u>
102.00169	.0092	.0476	5.463

$$\begin{array}{r}
 (10) \\
 3.00000 \\
 .00003 \\
 \hline
 2.99997
 \end{array}$$

$$\begin{array}{r}
 (11) \\
 29.0029 \\
 19.003 \\
 \hline
 9.9999
 \end{array}$$

$$\begin{array}{r}
 (12) \\
 5.000 \\
 .125 \\
 \hline
 4.875
 \end{array}$$

$$\begin{array}{r}
 (13) \\
 1000.0000 \\
 .0001 \\
 \hline
 999.9999
 \end{array}$$

$$\begin{array}{r}
 (14) \\
 1.000000 \\
 .000001 \\
 \hline
 .999999
 \end{array}$$

$$\begin{array}{r}
 (15) \\
 .025 \\
 .000025 \\
 \hline
 .024975
 \end{array}$$

Art. 147.

$$\begin{array}{r}
 (4) \\
 33.21 \\
 4.41 \\
 \hline
 3321 \\
 13284 \\
 13284 \\
 \hline
 146.4561
 \end{array}$$

$$\begin{array}{r}
 (5) \\
 32.16 \\
 22.5 \\
 \hline
 16080 \\
 6432 \\
 6432 \\
 \hline
 723.600
 \end{array}$$

$$\begin{array}{r}
 (6) \\
 .125 \\
 9 \\
 \hline
 1.125
 \end{array}$$

$$\begin{array}{r}
 (7) \\
 .35 \\
 7 \\
 \hline
 2.45
 \end{array}$$

$$(10.) .15 \times .7 = \frac{15}{100} \times \frac{7}{10} = \frac{105}{1000} = .105, \text{ Ans.}$$

$$(13.) 1.035 \times 17 = 17.595, \text{ Ans.}$$

$$\begin{array}{r}
 (14) \\
 19 \\
 .125 \\
 \hline
 95 \\
 38 \\
 19 \\
 \hline
 2.375
 \end{array}$$

$$\begin{array}{r}
 (15) \\
 4.5 \\
 4 \\
 \hline
 18.0
 \end{array}$$

$$\begin{array}{r}
 (16) \\
 .625 \\
 64 \\
 \hline
 2500 \\
 3750 \\
 \hline
 40.000
 \end{array}$$

$$\begin{array}{r}
 (17) \\
 61.76 \\
 .0071 \\
 \hline
 6176 \\
 43232 \\
 \hline
 .438496
 \end{array}$$

(18)	(24)	(25)
1.325	.1	100
<u>.0716</u>	<u>.01</u>	<u>.0001</u>
7950	.001	00.0100 = .01, <i>Ans.</i>
1325		
<u>9275</u>		
.0948700		
(26)	(27)	(28)
.043	40000	.09375
<u>.0021</u>	<u>.000001</u>	<u>1.064</u>
43	.040000	37500
<u>86</u>		56250
.0000903		<u>93750</u>
		.09975000

Art. 150.

SUGGESTIONS TO TEACHERS.—The division of decimals is generally a troublesome subject to pupils; this arises from a want of attention to the rule. Should the pupil be at a loss to understand why, in some cases, when the divisor and dividend are both decimals, the quotient should be a whole number, let him read the remarks on the division of fractions, page 120. When the divisor contains more decimal places than the dividend, it is best, before commencing the division, to reduce them both to the same denomination, that is, to make the number of decimal places the same in both; the quotient will then be a whole number.

(7)	(8)	(9)
.03)1.125	27.5)86.075(3.13, <i>Ans.</i>	3.44)24.73704(7.191, <i>Ans.</i>
37.5, <i>Ans.</i>	<u>825</u>	<u>2408</u>
	<u>357</u>	657
	275	<u>344</u>
	<u>825</u>	3130
	825	<u>3096</u>
		344
		<u>344</u>

$$\begin{array}{r}
 (10) \\
 4.123)206.166492(50.004, \text{ Ans.} \\
 \underline{20615} \\
 16492 \\
 \underline{16492}
 \end{array}$$

$$\begin{array}{r}
 (14) \\
 .008)2.000 \\
 \underline{250}, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (16) \\
 454)100.8788(.2222, \text{ Ans.} \\
 \underline{908} \\
 1007 \\
 \underline{908} \\
 998 \\
 \underline{908} \\
 908 \\
 \underline{908} \\
 908
 \end{array}$$

$$\begin{array}{r}
 (19) \\
 .19)21318(1.122, \text{ Ans.} \\
 \underline{19} \\
 23 \\
 \underline{19} \\
 41 \\
 \underline{38} \\
 38 \\
 \underline{38}
 \end{array}$$

$$\begin{array}{r}
 (21) \\
 3189)102048(.000032, \text{ Ans.} \\
 \underline{9567} \\
 6378 \\
 \underline{6378}
 \end{array}$$

$$\begin{array}{r}
 (13) \\
 .5)21.0(42, \text{ Ans.} \\
 \underline{20} \\
 10 \\
 \underline{10}
 \end{array}$$

$$\begin{array}{r}
 (15) \\
 5)37.20 \\
 \underline{7.44}, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 (18) \\
 .108649)9811.004700(90300, \text{ Ans.} \\
 \underline{977841} \\
 325947 \\
 \underline{325947} \\
 00
 \end{array}$$

$$\begin{array}{r}
 (20) \\
 .3189)102048.0000(320000, \text{ Ans.} \\
 \underline{9567} \\
 6378 \\
 \underline{6378} \\
 0000
 \end{array}$$

$$\begin{array}{r}
 (22) \\
 .0225)9.9000(440, \text{ Ans.} \\
 \underline{900} \\
 900 \\
 \underline{900} \\
 0
 \end{array}$$

$$\begin{array}{r} (26) \\ 10 \overline{)10} \end{array}$$

.01, *Ans.*

$$\begin{array}{r} (27) \\ .1 \overline{)1.0} \end{array}$$

10, *Ans.*

$$\begin{array}{r} (28) \\ .01 \overline{)10.00} \end{array}$$

1000, *Ans.*

$$(29.) \frac{1.7}{64} = \frac{1.7000000}{64} = .0265625, \text{ Ans.}$$

$$\begin{array}{r} (30) \\ 80 \overline{)0.080} \end{array}$$

.001, *Ans.*

$$\begin{array}{r} (31) \\ 7 \overline{)1.5000000} \end{array}$$

.2142857+, *Ans.*

$$(32) \quad 32.76 \overline{)11.100000000} (.3388278 + \text{ Ans.}$$

$$\begin{array}{r} 9828 \\ 12720 \\ 9828 \\ \hline 28920 \\ 26208 \\ \hline 27120 \\ 26208 \\ \hline 9120 \\ 6552 \\ \hline 25680 \\ 22932 \\ \hline 27480 \\ 26208 \\ \hline \end{array}$$

$$\begin{array}{r} (33) \\ 3.21 \overline{)0.0123000000} (.00383177 + \text{ Ans.} \\ 963 \\ \hline 2670 \\ 2568 \\ \hline 1020 \\ 963 \\ \hline 570 \\ 321 \\ \hline 2490 \\ 2247 \\ \hline 2430 \\ 2247 \\ \hline \end{array}$$

Art. 151.

$$(2.) .035 \text{ pk.} \times 8 = .280 \text{ qt.}; .28 \text{ qt.} \times 2 = .56 \text{ pt.}, \text{ Ans.}$$

$$(3.) .0075 \text{ bu.} \times 4 = .0300 \text{ pk.}; .03 \text{ pk.} \times 8 = .24 \text{ qt.}, \text{ Ans.}$$

$$(4.) .005 \text{ yd.} \times 3 = .015 \text{ ft.}, \times 12 = 0.180 \text{ in.} = .18 \text{ in.}, \text{ Ans.}$$

$$(5.) .00546875 \text{ A.} \times 160 = 0.87500000 \text{ sq. rd.} = .875 \text{ sq. rd.}, \text{ Ans.}$$

Art. 152.

(2.) $.75 \text{ yd.} \times 3 = 2.25 \text{ ft.}$: $.25 \text{ ft.} \times 12 = 3.00 \text{ in.}$
Ans. 2 ft. 3 in.

(3.) $.3375 \text{ A.} \times 160 = 54.0000 \text{ sq. rd.} = 54 \text{ sq. rd.,}$ *Ans.*

(4.) $.7 \text{ lb.} \times 12 = 8.4 \text{ oz.}$: $.4 \text{ oz.} \times 20 = 8.0 \text{ pwt.} = 8 \text{ pwt.}$ *Ans.* 8 oz. 8 pwt.

(5.) $.8125 \text{ bu.} \times 4 = 3.2500 \text{ pk.}$: $.25 \text{ pk.} \times 8 = 2.00 \text{ qt.}$
 $= 2 \text{ qt.}$ *Ans.* 3 pk. 2 qt.

(6.) $.44 \text{ mi.} \times 320 = 140.8 \text{ rd.}$: $.8 \text{ rd.} \times 5\frac{1}{2} = 4.4 \text{ yd.}$:
 $.4 \text{ yd.} \times 3 = 1.2 \text{ ft.}$: $.2 \text{ ft.} \times 12 = 2.4 \text{ in.}$ *Ans.* 140 rd.
 4 yd. 1 ft. 2.4 in.

(7.) $.33625 \text{ cwt.} \times 100 = 33.625 \text{ lb.}$: $.625 \text{ lb.} \times 16 = 10.000 \text{ oz.} = 10 \text{ oz.}$ *Ans.* 33 lb. 10 oz.

Art. 153.

(2.) $.72 \text{ qt.} \div 8 = .09 \text{ pk.,}$ $\div 4 = .0225 \text{ bu.,}$ *Ans.*

(3.) $.77 \text{ yd.} \div 5\frac{1}{2} = .14 \text{ rd.,}$ $\div 320 = .0004375 \text{ mi.,}$ *Ans.*

(4.) $.25 \text{ pt.} \div 2 = .125 \text{ qt.,}$ $\div 4 = .03125 \text{ gal.,}$ *Ans.*

(5.) $.6 \text{ pt.} \div 2 = .3 \text{ qt.,}$ $\div 8 = .0375 \text{ pk.}$ $\div 4 = .009375 \text{ bu.,}$ *Ans.*

(6.) $.7 \text{ rd.} \div 320 = .0021875 \text{ mi.,}$ *Ans.*

Art. 154.

(1.) $\$0.40 \times 9 = \3.60 : $\$0.75 \times 12 = \9.00 : $\$3.60 + \$9.00 = \$12.60,$ *Ans.*

(2.) $\$0.45 \times 2.3 = \1.035 : $\$0.375 \times 1.5 = \0.5625 : $\$1.035 + \$0.5625 = \$1.5975,$ *Ans.*

(3.) $\$2.6875 \times 16\frac{1}{4} = \$43.671875,$ *Ans.*

(4.) $35.25 \div .75 = 47 \text{ bu.,}$ *Ans.*

(5.) $98.4 \div 2.5625 = 38.4$ yd., *Ans.*

(6.) 6 cwt. 50 lb. = 6.5 cwt.: $\$3.25 \times 6.5 = \21.125 ,
Ans.

(7.) 14 bu. 3 pk. 4 qt. = 14.875 bu.: $\$0.625 \times 14.875 = \9.296875 , *Ans.*

(8.) 13 A. 115 sq. rd. = 13.71875 A.: $\$17.28 \times 13.71875 = \237.06 , *Ans.*

(9.) $\$9.296875 \div \$0.3125 = 29.75$ bu. = 29 bu. 3 pk.,
Ans.

(10.) $59.265 \div 4.32 = 13.71875$ A. = 13 A. 115 sq. rd.,
Ans.

(11.) 1 gal. would cost $\$ \frac{49}{63} = \$ \frac{7}{9} = \$0.77\frac{7}{9}$: $464 \times .77\frac{7}{9} = \360.88 , *Ans.*

	ft.	in.
(12.) .34 yd. $\times 3 = 1.02$ ft.:	1	.24
.02 ft. $\times 12 = .24$ in.:	1	.84
1.07 ft. $\times .07$ ft. $\times 12 = .84$ in.		8.92
	<i>Ans.</i> 2	10.00

	qt.	pt.
(13.) .625 gal. $\times 4 = 2.500$ qt.:	2	1
.5 qt. $\times 2 = 1.0$ pt.:		1.5
.75 qt. $\times 2 = 1.5$ pt.		.5
	<i>Ans.</i> 3	.5

	ft.	in.
(14.) 1.53 yd. $\times 3 = 4.59$ ft.:	4	7.08
.59 ft. $\times 12 = 7.08$ in.	2	3.08
	<i>Ans.</i> 2	4

(15.) $365.25 \times .05 = 18.2625$ da.: $.2625$ da. $\times 24 = 6.3$ hr.: 6.3 hr. — .5 hr. = 5.8 hr.: .8 hr. $\times 60 = 48$ min.
Ans. 18 da. 5 hr. 48 min.

(16.) .41 da. = 9.84 hr.: 9.84 hr. — .16 hr. = 9.68 hr.:
.68 hr. $\times 60 = 40.8$ min.: .8 min. $\times 60 = 48$ sec. *Ans.*
9 hr. 40 min. 48 sec.

(17.) $365.25 \text{ da.} \times .3 = 109.575 \text{ da.}$; $.575 \text{ da.} \times 24 = 13.8 \text{ hr.}$; $.8 \text{ hr.} \times 60 = 48 \text{ min.}$ *Ans.* 109 da. 13 hr. 48 min.

(18.) $3 \text{ in.} = \frac{1}{4} \text{ ft.}$; $2\frac{1}{4} \text{ or } \frac{9}{4} \text{ ft.} = \frac{3}{4} \text{ yd.}$; $343\frac{3}{4} \times \$0.16 = \55.00 , *Ans.*

(19.) $17 \text{ mi. } 135 \text{ rd.} = 17.421875 \text{ mi.}$; $\$690.35 \times 17.421875 = \12027.19140625 , *Ans.*

THE METRIC SYSTEM.

Art. 160.

(3.) $20 \text{ Km.} \times .62137 = 12.42740 \text{ mi.}$, *Ans.*

(4.) $160 \text{ acres} \div 2.471 = 64.75 + \text{Ha.}$, *Ans.*

(5.) $49 \text{ m.} \times 39.37 = 1929.13 \text{ in.}$, $\div 12 = 160 \text{ ft.}$ 9.13 in. ; $160 \text{ ft.} \div 3 = 53 \text{ yd.}$ 1 ft. ; $53 \text{ yd.} \div 5\frac{1}{2} = 9 \text{ rd.}$ $3\frac{1}{2} \text{ yd.}$; $\frac{1}{2} \text{ yd.} = \frac{3}{2} \text{ or } 1\frac{1}{2} \text{ ft.}$; $\frac{1}{2} \text{ ft.} = 6 \text{ in.}$; $9.13 \text{ in.} + 6 \text{ in.} = 15.13 \text{ in.} = 1 \text{ ft.}$ 3.13 in. ; $1 + 1 + 1 = 3 \text{ ft.} = 1 \text{ yd.}$; $3 \text{ yd.} + 1 \text{ yd.} = 4 \text{ yd.}$ *Ans.* 9 rd. 4 yd. 3.13 in.

(6.) $15 \text{ g.} \times 15.432 = 231.480 \text{ gr.}$ $\text{T.,} \div 24 = 9 \text{ pwt.}$ 15.48 gr. , *Ans.*

(7.) $42 \text{ bu.} \div 2.8375 = 14.8 + \text{Hl.}$, *Ans.*

(8.) $500 \text{ sters} \times .2759 = 137.95 \text{ C.}$, *Ans.*

(9.) $9 \text{ m.} \times 5 \text{ m.} = 4.5 \text{ m}^2$, $\times 1.196 = 5.382 \text{ sq. yd.}$, *Ans.*

(10.) $32 \text{ l.} \times 1.0567 = 33.8144 \text{ qt.}$, $\div 4 = 8.4536 \text{ gal.}$, *Ans.*

Art. 161.

(1.) $127 \text{ dl.} + 234.5 \text{ dl.} = 361.5 \text{ dl.}$, $\div 10 = 36.15 \text{ l.}$; $1563 \text{ cl.} \div 100 = 15.63 \text{ l.}$; $4.87 \text{ l.} + 36.15 \text{ l.} + 15.63 \text{ l.} = 56.65 \text{ l.}$, *Ans.*

(2.) $45 \text{ Ha.} = 4500 \text{ a., @ } \$3.32 = \$14940$, *Ans.*
Key 10.

(3.) $457.92 \div 3 = 152.64$ m., *Ans.*

(4.) $.72 \times .48 \times .5 = .1728$: $\$.8640 \div .1728 = \5 , *Ans.*

(5)	(6)	(7)
380)454.10(1.195	4685	346.75)194.1800(0.56
<u>380</u> <i>Ans.</i> \$1.195	<u>1.6</u>	<u>173375</u>
741	28110	208050
<u>380</u>	<u>4685</u>	<u>208050</u>
3610	7496.0	
<u>3420</u>		<i>Ans.</i> \$0.56
1900	<i>Ans.</i> 7496 Hl.	
<u>1900</u>		

(8.) $1 \text{ M.} \times 100 = 100 \text{ cm.}$: $100 \div 2 = 50$, the number of coins: $50 \times 5 \text{ g.} = 250 \text{ g.}$, *Ans.*

(9.) $1.25 \times 6.5 = 8.125$, $\div 1.85 = 4.39+$ m., *Ans.*

(10.) $60 \text{ mi.} \div .62137 = 96.56+$ Km., *Ans.*

(11.) $29 \text{ Mm.} \times 22.4 \text{ Mm.} = 649.6 \text{ Mm.}^2$, *Ans.*

(12.) $13.24 \text{ Km.} \times 1000 = 13240 \text{ m.}$, $\div .715 \text{ m.} = 18517+$, which would, of course, necessitate his taking 18518 steps, *Ans.*

NOTE.—The answer to the example given here is also 18517+ steps.

PERCENTAGE.

Art. 164.

(6)	(7.) $240 \times .03\frac{3}{4} = 9$, <i>Ans.</i>
165	
<u>.03$\frac{1}{2}$</u>	(14.) $8\frac{1}{3}\% = \frac{1}{12}$: $\frac{1}{12}$ of 384 = 32, <i>Ans.</i>
495	
<u>55</u>	(16.) $12\frac{1}{2}\% = \frac{1}{8}$: $\frac{1}{8}$ of 292 = 36.5, <i>Ans.</i>
5.50, <i>Ans.</i>	

$$(19.) \quad 18\frac{3}{4} = \frac{3}{16} : \frac{.7}{1} \times \frac{3}{16} = 2.1, \text{ Ans.}$$

$$(20.) \quad 20\% = \frac{1}{5} : \frac{1.97}{1} \times \frac{1}{5} = 1.97, \text{ Ans.}$$

$$(21.) \quad 25\% = \frac{1}{4} : \frac{1}{4} \text{ of } 43 = 10.75, \text{ Ans.}$$

$$(22.) \quad 33\frac{1}{3}\% = \frac{1}{3} : \frac{1}{3} \text{ of } 6.93 = 2.31, \text{ Ans.}$$

$$(23.) \quad 45 \times 5.7 = 2.565, \text{ Ans.}$$

$$(24.) \quad 50\% = \frac{1}{2} : \frac{1}{2} \text{ of } 38.75 = 19.375, \text{ Ans.}$$

$$(25.) \quad \frac{1}{2}\% = \frac{1}{200} : \frac{1}{200} \text{ of } 456 = 2.28, \text{ Ans.}$$

$$(26.) \quad \frac{3}{8}\% = .00375 : 464 \times .00375 = 1.74, \text{ Ans.}$$

$$(27.) \quad \frac{7}{16} = .4375 : 144 \times .4375 = 63, \text{ Ans.}$$

$$(28.) \quad 125\% = \frac{5}{4} : \frac{5}{4} \text{ of } 36 = 45, \text{ Ans.}$$

$$(29.) \quad 208\% \text{ of } 650 = 650 \times 2.08 = 1352, \text{ Ans.}$$

$$(30.) \quad 4\frac{1}{2} \text{ times } 12 = 48 + 6 = 54, \text{ Ans.}$$

$$(31.) \quad 10 \text{ times } 24.75 = 247.5, \text{ Ans.}$$

Art. 165.

$$(3.) \quad 3 \text{ is } \frac{1}{5} \text{ of } 15 : \frac{1}{5} = 20\%, \text{ Ans.}$$

$$(4.) \quad 6 \text{ is } \frac{3}{25} \text{ of } 50 : \frac{3}{25} = .12 = 12\%, \text{ Ans.}$$

$$(5.) \quad 4.5 \text{ is } \frac{4.5}{75}\% \text{ of } 75 = \frac{3}{5} = .6 = 6\%, \text{ Ans.}$$

$$(11) \quad 243)8.505(.035 = 3\frac{1}{2}\%, \text{ Ans.}$$

$$\begin{array}{r} 729 \\ \hline 1215 \\ \hline 1215 \\ \hline \end{array}$$

$$(12.) \quad .002 \text{ of } 2 = .002 \div 2 = .001 = \frac{1}{10} \text{ of } 1\%, \text{ Ans.}$$

$$(13.) \quad 13.245 \div 3532 = .00375 = \frac{375}{100000} = \frac{3}{8}\%, \text{ Ans.}$$

$$(14.) \quad \frac{3}{\cancel{25}_5} \times \frac{5}{4} = \frac{3}{20} = 15\%, \text{ Ans.}$$

$$(15.) \quad \frac{2}{\cancel{15}_5} \times \frac{3}{2} = \frac{1}{5} = 20\%, \text{ Ans.}$$

$$(16.) \quad \frac{2}{\cancel{7}} \times \frac{\cancel{21}_8}{\cancel{16}_8} = \frac{3}{8} = 37\frac{1}{2}\%, \text{ Ans.}$$

$$(17.) \quad \frac{3}{4} \times \frac{3}{\cancel{35}_5} = \frac{9}{20} = 45\%, \text{ Ans.}$$

$$(18.) \quad \frac{\cancel{65}_2}{6} \times \frac{9}{\cancel{520}_8} = \frac{3}{16} = 18\frac{3}{4}\%, \text{ Ans.}$$

Art. 166.

$$(3.) \quad 20\% = \frac{1}{5}: 60 \times 5 = 300, \text{ Ans.}$$

$$(4.) \quad 75\% = \frac{3}{4}. \text{ If } 90 \text{ is } \frac{3}{4}, \frac{1}{4} = 30, \text{ and } \frac{4}{4} = 120, \text{ Ans.}$$

$$(5.) \quad 125\% = \frac{5}{4}. \text{ If } 85 \text{ is } \frac{5}{4}, \frac{1}{4} = 17, \text{ and } \frac{4}{4} = 68, \text{ Ans.}$$

$$(6.) 7.13 \div .23 = 31, \text{ Ans.}$$

$$(7.) 20.23 \div .34 = 59.5, \text{ Ans.}$$

$$(8.) 23.5 \div .47 = 50, \text{ Ans.}$$

(9.) If 45 is $1\frac{1}{2}\%$, $\frac{1}{2}\%$ is $\frac{1}{3}$ of $45 = 15$: $1\% = 2$ times $15 = 30$: 100 times $30 = 3000$, the number.

$$(10.) 12\frac{1}{2}\% = \frac{1}{8}: 2.25 \times 8 = 18, \text{ Ans.}$$

$$(11.) 1\% \text{ is } \frac{1}{250} \text{ of } \frac{3}{4} = \frac{3}{1000}: 100\% \text{ is 100 times } \frac{3}{1000} = \frac{300}{1000} = \frac{3}{10}, \text{ Ans.}$$

$$(12.) 14\frac{2}{7} = \frac{100}{7}: 16\frac{2}{3}\% = \frac{1}{6}. \text{ If } \frac{100}{7} = \frac{1}{6}, \frac{6}{6} = \frac{600}{7} = 85\frac{5}{7}, \text{ Ans.}$$

Art. 167.

$$(3.) 721 \div 1.03 = 700, \text{ Ans.}$$

$$(4.) 100\% - 66\% = 34\%: 68 \div .34 = 200, \text{ Ans.}$$

$$(5.) \text{ If } 2125 = \frac{5}{4}, \frac{1}{4} = 425, \text{ and } \frac{4}{4} = 1700, \text{ Ans.}$$

$$(6.) \text{ If } 7.52 = \frac{94}{100}, \frac{1}{100} = \frac{7.52}{94} = 8, \text{ and the number} = 8, \text{ Ans.}$$

$$(7.) 37\frac{1}{2}\% = \frac{3}{8}. \text{ If } 8250 = \frac{11}{8}, \frac{1}{8} = 750, \text{ and } \frac{8}{8} = 6000, \text{ Ans.}$$

$$(8.) 10\% = \frac{1}{10}, \text{ then } \frac{9}{10} \text{ of the fraction} = \frac{3}{8}: \frac{3}{8} \times \frac{10}{9} = \frac{30}{72} = \frac{5}{12}, \text{ Ans.}$$

$$(9.) 20\% = \frac{1}{5}. \text{ If } 6.6 = \frac{6}{5}, \frac{1}{5} = 1.1, \text{ and } \frac{5}{5} = 5.5, \text{ Ans.}$$

Art. 169.

$$(1.) 800 \times .36 = 288.00: \$800 - \$288 = \$512, \text{ Ans.}$$

$$(2.) 300 - 225 = 75 = \frac{1}{4} \text{ of } 300 = 25\%, \text{ Ans.}$$

(3.) $100\% - 40\% = 60\% = \frac{6}{10}$. If $\$3000 = \frac{6}{10}$, $\frac{1}{10} = \$500$, and $\frac{4}{10} (40\%) = \$2000$, *Ans.*

(4.) If 56 ct. = 140% of the cost, the cost = $56 \div 1.40 = 40$ ct., *Ans.*

(5.) $12\frac{1}{2}\% = \frac{1}{8}$: $\$175 = \frac{7}{8}$, $\frac{1}{8} = 25$, and $\frac{8}{8} = \$200$, *Ans.*

(6.) $75 \times 4 = 300$: $\frac{1}{8}$ of 300 = $37\frac{1}{2}$: $300 - 37\frac{1}{2} = 262\frac{1}{2}$, $\times 35$ ct. = $\$91.87\frac{1}{2}$, *Ans.*

(7.) $\$500 - \$425 = \$75$: $7500 \div 500 = 15\%$, *Ans.*

(8.) $100\% - 75\% = 25\%$: $\$5000 = 25\% = \frac{1}{4}$; then $\frac{4}{4} = \$20000$, and $\$20000 - \$5000 = \$15000$, *Ans.*

(9.) $12\frac{1}{2}\% = \frac{1}{8}$: 250 A. 86 sq. rd. = 40086 sq. rd. = $\frac{8}{8}$ of neighbor's: $\frac{1}{8} = 4454$, and $\frac{8}{8} = 35632$ sq. rd., $\div 160 = 222$ A. 112 sq. rd., *Ans.*

(10.) $160 \times .35 = 56.00$: $160 + 56 = 216$, *Ans.*

(11.) 5 bu. $\times 32 = 160$ qt.: $6.00 \div 160 = 3\frac{3}{4}\%$, *Ans.*

(12.) $60\% = \frac{6}{10}$: $\frac{6}{10}$ of $45\% = \frac{270}{10} = 27\%$: $540 \div .27 = 2000$ A., *Ans.*

(13.) $371.29 \div 1.07 = \$347$, *Ans.*

(14.) $18 + 15 + 23 + 12 = 68\%$: $100 - 68 = 32\%$: $\$800 \times .32 = \256 , *Ans.*

(15.) $\frac{1}{20} = 5\%$: $\frac{17}{20} = 17 \times 5 = 85\%$, *Ans.*

(16.) $33\frac{1}{3}\% = \frac{1}{3}$: 2 bu. 3 pk. = $\frac{1}{3}$ of 6 bu. 9 pk. = 8 bu. 1 pk., *Ans.*

(17.) 100% less $7\frac{1}{2}\% = 92\frac{1}{2}\%$: $37 \div .925 = 40$, *Ans.*

(18.) $25.8 - 2.58 (10\%) = 23.22$ grains, *Ans.*

(19.) $1.25 = \frac{1}{4}$ of 5: $\frac{3}{4}$ remain = 75% , *Ans.*

(20.) $25\% = \frac{1}{4}$. If $\$150 = \frac{5}{4}$, $\frac{1}{4} = 30$, and $\frac{4}{4} = \$120 =$ cost: $\$200 - \$120 = \$80$: $\frac{80}{120} = \frac{2}{3} = 66\frac{2}{3}\%$, *Ans.*

Art. 172.

$$(1.) \$240 \times .05 = \$12, \text{ Ans.}$$

$$(2.) 11.50 \div 460 = .02\frac{1}{2} = 2\frac{1}{2}\%, \text{ Ans.}$$

$$(3.) \$8.12\frac{1}{2} = 2\frac{1}{2}\% \text{ of the selling price: } \$8.12\frac{1}{2} \div .02\frac{1}{2} = \$325, \text{ selling price: 1 barrel sold for } \frac{1}{2}\% \text{ of } \$325 = \$13, \text{ Ans.}$$

$$(4.) 210 \div 1.05 = \$200, \text{ Ans.}$$

$$(5.) \$180 \times .04 = \$7.20: \$180 - \$7.20 = \$172.80, \text{ Ans.}$$

$$(6.) \text{ If } \$11.25 = \frac{1}{20} (5\%), \frac{2}{20} = \$225, \text{ Ans.}$$

$$(7.) \$1323.54 \div 1.08 = \$1225.50, \text{ cost of goods: } \$1323.54 - \$1225.50 = \$98.04, \text{ commission, Ans.}$$

$$\left. \begin{array}{rcl} (8.) & 250 \times \$15 & = \$3750 \\ & 175 \times \$7 & = 1225 \\ & 1456 \times \$0.25 & = 364 \end{array} \right\} = \$5339$$

$$3\% \text{ of } \$5339 = \$160.17: \$5339 - \$160.17 = \$5178.83, \text{ Ans.}$$

Art. 173.

$$(1.) 20\% = \frac{1}{5}: \frac{1}{5} \text{ of } \$225.50 = \$45.10: \$225.50 - \$45.10 = \$180.40, \text{ Ans.}$$

$$(2.) \frac{1}{3} \text{ of } \$725.16 = 241.72: \$725.16 - 241.72 = 483.44, \\ \times .05 = 24.17+: \$483.44 - \$24.17 = \$459.27, \text{ Ans.}$$

$$(3.) 100\% - 3\% = 97\%: 1430.75 \div .97 = \$1475, \text{ Ans.}$$

$$(4.) 100\% - 5\% = 95\%: \$390.45 \div .95 = \$411: 100\% - 25\% = 75\%: \$411 \div .75 = \$548, \text{ Ans.}$$

$$(5.) 10\% = \text{first discount; } 100\% - 10\% = 90\%: 10\% \text{ of } 90\% = 9\%, \text{ second discount; } 90\% - 9\% = 81\%: 10\% \text{ of } 81\% = 8.1\%, \text{ third discount: } 10\% + 9\% + 8.1\% = 27.1\%, \text{ sum of the three discounts: } \$325.20 \div .271 = \$1200: 1 \text{ doz. cost } \frac{1}{20} \text{ of } \$1200 = \$60, \text{ Ans.}$$

$$(6.) 100 \text{ doz. @ } 60 \text{ ct.} = \$60.00, \text{ less } \$24 (40\%) = \$36, \\ \text{less } \$3.60 (10\%) = \$32.40, \text{ less } \$2.43 (7\frac{1}{2}\%) = \$29.97, \text{ Ans.}$$

(7.) \$50 less 50% = \$25, less 10% = \$22.50, less 10% = \$20.25, less 2% = \$19.845, $\div 10 = \$1.98+$, *Ans.*

Art. 174.

(1.) $\$40 + 10\% = \44 , *Ans.*

(2.) 5 ct. = $\frac{5}{6}$ the cost; the loss, therefore, is $\frac{1}{6} = 16\frac{2}{3}\%$, *Ans.*

(3.) $12\frac{1}{2} = \frac{1}{8}$; then 27 ct. = $\frac{9}{8}$ of the cost, $\frac{1}{8} = 3$ ct., and $\frac{8}{8}$ or the cost = 24 ct., *Ans.*

(4.) $\$15.30 \div .04 = \382.50 , *Ans.*

(5.) $37\frac{1}{2}\% = \frac{3}{8}$: $\$8 + \text{its } \frac{3}{8} = \11 , *Ans.*

(6.) $90 - 75 = 15 = \frac{1}{5}$ of 75 = 20%, *Ans.*

(7.) $6\frac{1}{4}\% = \frac{1}{16}$. If 5 ct. = $\frac{1}{16}$ of the cost, the cost = 80 ct., *Ans.*

(8.) $18\frac{3}{4}\% = \frac{3}{16}$; then $\$4.75 = \frac{1}{16}$, $\frac{1}{16} = \$0.25$, and $\frac{1}{16} = \$0.25 \times 16 = \4 , *Ans.*

(9.) $\$1.35 = \frac{9}{10}$ of the cost, $\frac{1}{10} = \$0.15$, and $\frac{1}{10} = \$1.50$ = cost: $16\frac{2}{3}\% = \frac{1}{6}$: $\frac{1}{6}$ of 1.50 = .25: $\$1.50 + \$0.25 = \$1.75$, *Ans.*

(10.) $25\% = \frac{1}{4}$: $\frac{1}{4}$ of $\$874 = \218.50 , *Ans.*

(11.) $\$1.75 - \$0.25 = \$1.50$: $25 = \frac{1}{6}$ of 150 = $16\frac{2}{3}\%$, *Ans.*

(12.) On the first horse $\$150 = \frac{5}{4}$ cost, $\frac{1}{4} = \$30$, and the cost = $\$120$: on the second horse $\$150 = \frac{3}{4}$ cost, $\frac{1}{4} = \$50$, and the cost = $\$200$: $\$200 + \$120 = \$320$, — $\$300 = \20 , *Ans.*

(13.) 5 ct. = 10% — 8% = 2% of the cost per yd. If 2% = 5 ct., 1% = $2\frac{1}{2}$ ct., and 100% = $\$2.50$, *Ans.*

(14.) 60 ct. $\times 10000 = \$6000$, cost of the corn: 65 ct. $\times 7000 = \$4550$: $10000 - 7000 = 3000$: 55 ct. $\times 3000 = \$1650$: $\$4550 + \$1650 = \$6200$, the selling price: $\$6200 - \$6000 = \$200$ gain: $\$200 = \frac{1}{30}$ of $\$6000 = 3\frac{1}{3}\%$, *Ans.*

(15.) $33\frac{1}{3}\% = \frac{1}{3}$; then $\$12000 = \frac{4}{3}$, $\frac{1}{3} = \$3000$, and $\frac{2}{3} = \$9000 =$ cost of house and lot. The profit was $\$3000$. On the city lots he lost $\frac{1}{3}$. $\frac{1}{3}$ of 12000 = 4000: $\$4000 - \$3000 = \$1000$, *Ans.*

Art. 175.

(1.) $100\% - 20\% = 80\%$, cost price. If he sell at the list price, he will gain $\frac{20}{80} = \frac{1}{4} = 25\%$, *Ans.*

(2.) $74 \times 5 \times 45 = 166.50$, less 3.33 (2%) = $\$163.17$: $12\frac{1}{3}\%$ of this amount = $\$20.12+$, *Ans.*

(3.) $\$45$ less $5\% = \$42.75$, $\div 12 = \$3.56\frac{1}{4} =$ cost per pair: $\$4.25 - \$3.56\frac{1}{4} = \$0.68\frac{3}{4} =$ gain per pair: $5 \times 12 = 60 =$ number of pairs: $60 \times \$0.68\frac{3}{4} = \41.25 , *Ans.*

(4.) The profit on 36 hats equals 36 times $37\frac{1}{2}$ ct., which is $\$13.50$. If $\$13.50 = \frac{1}{8}$ of the cost, $\frac{8}{8}$ are 8 times $\$13.50 = \108 : $\$108 = \frac{9}{10}$ of the list price: $\frac{10}{9} = \$12$, $\frac{10}{9} = \$120$, *Ans.*

(5.) $\$1 \times 100 = \100 : $\$100$ less $60\% = \$40$: $\$40$ less $5\% = \$38$: $\$38$ less $5\% = \$36.10$: $\$36.10 + \$23.90 = \$60$: $\$60 \div (100 \times 12)$ or $1200 = 5$ ct., *Ans.*

(6.) 100 bbl. @ $\$9.50 = \950 , less $2\frac{1}{2}\% = \$23.75$, less $\$17.25 = \909 : $\$909 - (100 \times \$7.50)$ or $\$750 = \159 , *Ans.*

(7.) $80 \times \$125 = \10000 , $+ \$200 = \10200 : $\$10450 - \$10200 = \$250 = 2\frac{1}{2}\%$ of $\$10000$. *Ans.* $2\frac{1}{2}\%$.

(8.) 1500 lb. $\times 50 = 75000$ lb.: $10\frac{1}{2}$ ct. $\times 75000 = \$7875$: 2% of $\$7875 = \157.50 , commission: $\$157.50 + \22.50 , charges, = $\$180$: $\$7875 - \$180 = \$7695$, that the consignor receives: $\$7695 = 114\%$ of the cost price: $\$7695 \div 1.14 = \6750 , cost: $\$6750 \div 75000 = 9$ ct., cost per pound.

(9.) $60 \times 70 \text{ ct.} = \42.00 : $\$42$ less 50% and 10% and $5\% = \$17.955$: $\$42$ less 20% and 10% and $5\% = \$28.728$: $\$28.728 - \$17.955 = \$10.773$, *Ans.*

(10.) $\$35.91 = 112\%$ of the cost: $\$35.91 \div 1.12 = \$32.06\frac{1}{4}$, the cost: $\$32.06\frac{1}{4} \div .95 = \33.75 : $\$33.75 \div .90 = \37.50 : $\$37.50 \div .75 = \$50 =$ the list price: $\$50 \div 50 = \1 , list price per gross, *Ans.*

Art. 177.

(1.) 1% of $\$7500$ is $\$75$, and $\frac{1}{4}\%$ is $\frac{1}{4}$ of $\$75 = \18.75 , *Ans.*

(2.) 50 shares = $\$5000$: $\$6.25 \div \$5000 = .00125 = \frac{1}{8}\%$, *Ans.*

(3.) $\$10 = \frac{1}{4}\%$ of the investment: $1\% = 4$ times $\$10 = \40 : $100\% = 100$ times $\$40 = \$4000 = 40$ shares, *Ans.*

(4.) 1% on $\$1700 = \17.00 , and $\frac{1}{4}\% = \$4.25$, *Ans.*

(5.) 95 shares = $\$9500$: $\$11.875 \div \$9500 = .00125 = \frac{1}{8}\%$, *Ans.*

(6.) If $\$9.50 = \frac{1}{4}\%$, $1\% = \$38$, and $100\% = \$3800 = 38$ shares, *Ans.*

Art. 178.

(1.) The dividend will be 3500 times 4 ct. or $(\$0.04) = \140 , *Ans.*

(2.) If $\$300$ is $7\frac{1}{2}\% = \frac{15}{2}\%$, $\frac{1}{2}\%$ is $\$20$, and 1% is $\$40$. If $\$40 = 1\%$, then 100% is $\$4000 = 40$ shares, *Ans.*

(3.) 15% on $\$8000 = \1200 , *Ans.*

(4.) $5\% = \frac{1}{20}$: $\frac{1}{20}$ of $60 = 3$: $60 + 3 = 63$ shares, *Ans.*

(5.) $\$15700 - \$4500 = \$11200$: $11200 \div 160000 = .07 = 7\%$, *Ans.*

Art. 179.

(1.) 150 shares of \$50 each are equivalent to 75 shares of \$100.

$$139\frac{3}{4} \times 75 = \$10481.25$$

$$\frac{1}{4}\% \text{ brokerage on } \$7500 = \underline{18.75}$$

$$\$10500.00, \text{ Ans.}$$

$$(2.) \quad \$8000 \times 1.10 = \$8800$$

$$\frac{1}{8}\% \text{ brokerage on } \$8000 = \underline{10}$$

$$\$8810, \text{ Ans.}$$

$$(3.) \quad \frac{1}{4}\% \text{ brokerage on } 50 \text{ shares} = \$12.50: \$2475 + \$12.50 = \$2487.50: 2487.50 \div 50 = 49\frac{3}{4}\%, \text{ Ans.}$$

$$(4.) \quad \$25000 \times 1.141\frac{1}{4} = \$28562.50$$

$$\frac{1}{8}\% \text{ brokerage on } \$25000 = \underline{31.25}$$

$$\$28593.75, \text{ Ans.}$$

$$(5.) \quad 19\frac{1}{4} + \frac{1}{4} = 19\frac{1}{2} \text{ or } 19.5: \$1560 \div 19.5 = 80, \text{ Ans.}$$

$$(6.) \quad 100 \div 1.05 = 95\frac{5}{21} \text{ ct., Ans.}$$

$$(7.) \quad 1.12\frac{1}{2} = 1\frac{1}{8} = \frac{9}{8}: 100 \times \frac{8}{9} = \frac{800}{9} = 88\frac{8}{9} \text{ ct., Ans.}$$

$$(8.) \quad 35\frac{5}{7} = 25\frac{0}{7}: 100 \times \frac{7}{250} = 2.80 = 280, \text{ Ans.}$$

$$(9.) \quad \$8946.25 \div 1.0525 = \$8500, \text{ Ans.}$$

$$(10.) \text{ If } \$15.62\frac{1}{2} = \frac{1}{16}\%, \quad 1\% = \$250, \text{ and } 100\% = \$25000: \$25734.37\frac{1}{2} - \$25000 = \$734.375; \text{ adding the brokerage to this} = \$750: \$750 \div 25000 = .03 = \text{gold premium: } 103 = \text{Ans.}$$

Art. 180.

$$(1.) \quad \$39900 \times .06 = \$2394, \text{ Ans.}$$

$$(2.) \quad \$39900 \div 1.05 = \$38000: \$38000 \times .06 = \$2280, \text{ Ans.}$$

$$(3.) \quad \$39900 \div .95 = \$42000: 42000 \times .06 = \$2520, \text{ Ans.}$$

(4.) If gold was *at par*, 6% interest on \$20000 would be \$1200; at 7% premium it would yield an income 7% greater = \$1284, *Ans.*

(5.) $\$5220 \div 1.16 = \4500 = amount in bonds; $\$4500 \times .06$ (%) = \$270. Gold being at 5% premium, add to \$270 its 5% = \$13.50; $\$270 + \$13.50 = \$283.50$, *Ans.*

(6.) $4\frac{1}{2}$ per cents, when gold is at 105, would yield an income $\frac{1}{20}$ greater than when at par. $4.5 + (\frac{1}{20} \text{ of } 4.5)$ or .225 = 4.725: $4.725 \div 1.08 = 4\frac{3}{8}\%$, *Ans.*

$$(7.) \quad 2 \\ 37\frac{1}{2}\% = \frac{3}{8} : \frac{6\%}{1} \times \frac{8}{3} = 16\%, \text{ Ans.}$$

(8.) $\$1921 \div 1.13 = \1700 = annual income in gold. $\$1700 \div .05 = \34000 : $\$34000 \times 1.18 = \40120 , *Ans.*

(9.) $95\frac{1}{4} + \frac{1}{4} = 95\frac{1}{2}$: $105 - \frac{1}{4} = 104\frac{3}{4}$: $104\frac{3}{4} - 95\frac{1}{2} = 9\frac{1}{4}\%$ = .0925: $\$925 \div .0925 = \$10000 = 100$ shares, *Ans.*

(10.) $6 = \frac{3}{4}$ of 8: $\frac{3}{4} = 75\%$, *Ans.*

(11.) $\$4982 \div 1.06 = \4700 = amount of bonds that can be bought: 4% on \$4700 = \$188, *Ans.*

(12.) $7 \div .87\frac{1}{2} = .08 = 8\%$, *Ans.*

(13.) $.07 \div .06 = 116\frac{2}{3}$, *Ans.*

INTEREST.

SIMPLE INTEREST.

Art. 183.

1st. *When the time is one year.*

(7.) $6\frac{1}{4}\% = \frac{1}{16}$: $\$7200 \div 16 = \450 , *Ans.*

(8.) $8\frac{1}{3}\% = \frac{1}{12}$: $\$28.20 \div 12 = \2.35 : $\$28.20 + \$2.35 = \$30.55$, *Ans.*

(9.) $10\% = \frac{1}{10} : \frac{1}{10}$ of 45.50 = 4.55 : \$45.50 + \$4.55 = \$50.05, *Ans.*

(10.) $\$420 \times .05\frac{1}{8} = \$22.40, + \$420 = \$442.40, \text{ Ans.}$

(11.) $\$857 \times .09 = \$77.13, + \$857 = \$934.13, \text{ Ans.}$

(12.) $\$96 \times .08\frac{1}{2} = \$8.16, + \$96 = \$104.16, \text{ Ans.}$

(13.) $\$2000 \times .04\frac{1}{2} = \$90, + \$2000 = \$2090, \text{ Ans.}$

(14.) $12\frac{1}{2}\% = \frac{1}{8} : \$164 \div 8 = \$20.50, + \$164 = \$184.50, \text{ Ans.}$

2d. *When the time is two or more years.*

(8.) $\$45 \times .08 = \$3.60 : \$3.60 \times 2 = \$7.20 : \$7.20 + \$45 = \$52.20, \text{ Ans.}$

(9.) $\$80 \times .07 = \$5.60 : \$5.60 \times 4 = \$22.40 : \$80 + \$22.40 = \$102.40, \text{ Ans.}$

(10.) $3\frac{3}{4}\% \times 2 = 7\frac{1}{2}\% : \$237.16 \times .07\frac{1}{2} = \$17.79 : \$237.16 + \$17.79 = \$254.95, \text{ Ans.}$

(11.) $4\% \times 5 = 20\% = \frac{1}{5} : \$74.75 \div 5 = \$14.95 : \$74.75 + \$14.95 = \$89.70, \text{ Ans.}$

(12.) $\$85.45 \times .06 = \$5.127 : \$5.127 \times 4 = \$20.51 : \$20.51 + \$85.45 = \$105.96, \text{ Ans.}$

(13.) $\$325 \times .05\frac{2}{5} = \$17.55 : \$17.55 \times 3 = \$52.65 : \$52.65 + \$325 = \$377.65, \text{ Ans.}$

(14.) $\$129.36 \times .04\frac{3}{8} = \$5.6595 : \$5.6595 \times 4 = \$22.638 : \$22.64 + \$129.36 = \$152, \text{ Ans.}$

(15.) $\$8745 \times .16 = \$1399.20, + \$8745 = \$10144.20, \text{ Ans.}$

3d. *When the time is any number of months.*

(2.) $\$300 @ 6\%, 1 \text{ yr.} = \$18 : 1 \text{ mo.} = \frac{1}{12} \text{ yr.} : \$18 \div 12 = \$1.50, \text{ Ans.}$

$$(3.) \$240 \times .08 = \$19.20: 2 \text{ mo.} = \frac{1}{6} \text{ yr.}: \$19.20 \div 6 = \$3.20, \text{ Ans.}$$

$$(4.) \$50 \times .06 = \$3.00: 4 \text{ mo.} = \frac{1}{3} \text{ yr.}: \frac{1}{3} \text{ of } \$3.00 = 1.00 \\ 1 \text{ mo.} = \frac{1}{4} \text{ of } 4 \text{ mo.}: \frac{1}{4} \text{ of } 1.00 = .25 \\ \text{Interest } 5 \text{ mo.} = \underline{\$1.25}$$

$$(5.) \$86 \times .06 = \$5.16: 3 \text{ mo.} = \frac{1}{4} \text{ yr.}: \frac{1}{4} \text{ of } \$5.16 = \$1.29, \text{ Ans.}$$

$$(6.) \$50 \times .08 = \$4.00: 4 \text{ mo.} = \frac{1}{3} \text{ yr.}: \frac{1}{3} \text{ of } \$4.00 = \$1.33+, \text{ Ans.}$$

$$(7.) \$150.25 \times .08 = \$12.0200: 6 \text{ mo.} = \frac{1}{2} \text{ yr.}: \frac{1}{2} \text{ of } \$12.02 = \$6.01: \$150.25 + \$6.01 = \$156.26, \text{ Ans.}$$

$$(8.) \$360 \times .05 = \$18: 6 \text{ mo.} = \frac{1}{2} \text{ yr.}: \frac{1}{2} \text{ of } \$18 = \$9: \\ 1 \text{ mo.} = \frac{1}{6} \text{ of } 6 \text{ mo.}: \frac{1}{6} \text{ of } \$9 = \$1.50: \$9 + \$1.50 = \\ \$10.50 = \text{int. } 7 \text{ mo.}: \$360 + \$10.50 = \$370.50, \text{ Ans.}$$

$$(9.) \$204 \times .07 = \$14.28 \quad 10 \text{ mo.} = \frac{10}{12} \text{ yr.} \\ \frac{10}{12} \text{ of } 14.28 = 11.90 \quad 1 \text{ mo.} = \frac{1}{10} \text{ of } 10 \text{ mo.} \\ \frac{1}{10} \text{ of } 11.90 = \underline{1.19} \\ \text{Int. } 11 \text{ mo.} = \$13.09, + \$204 = \$217.09. \text{ Ans.}$$

$$(10.) \$228 \times .06 = \$13.68 \quad 6 \text{ mo.} = \frac{1}{2} \text{ yr.} \\ \frac{1}{2} \text{ of } 13.68 = 6.84 \quad 3 \text{ mo.} = \frac{1}{2} \text{ of } 6 \text{ mo.} \\ \frac{1}{2} \text{ of } 6.84 = \underline{3.42} \\ \text{Int. } 9 \text{ mo.} = \$10.26, + \$228 = \$238.26, \text{ Ans.}$$

$$(11.) \$137.50 \times .06 = \$8.25: 8 \text{ mo.} = \frac{2}{3} \text{ yr.}: \frac{1}{3} \text{ of } \$8.25 \\ = \$2.75, \frac{2}{3} = \$5.50: \$137.50 + \$5.50 = \$143, \text{ Ans.}$$

$$(12.) \$7596 \times .08 = \$607.68: 10 \text{ mo.} = \frac{5}{6} \text{ yr.}: \frac{5}{6} \text{ of } \$607.68 \\ = \$506.40: \$7596 + \$506.40 = \$8102.40, \text{ Ans.}$$

4th. When the time is any number of days.

$$(2.) \$360 \times .06 = 21.60: \frac{1}{12} (1 \text{ mo.}) \text{ of } \$21.60 = \$1.80: \\ 20 \text{ da.} = \frac{2}{3} \text{ mo.}: \frac{2}{3} \text{ of } \$1.80 = \$1.20, \text{ Ans.}$$

(3.) $\$726 \times .06 = \43.56 : $\frac{1}{12}$ (1 mo.) of $\$43.56 = \3.63 :
 10 da. $= \frac{1}{3}$ mo.: $\frac{1}{3}$ of $\$3.63 = \1.21 , *Ans.*

(4.) $\$1200 \times .06 = \72 : $\frac{1}{12}$ of $\$72 = \$6 = \text{int. 1 mo.}$:
 15 da. $= \frac{1}{2}$ mo.: $\frac{1}{2}$ of $\$6 = \3 , *Ans.*

(5.) $\$180 \times .08 = \14.40 : $\frac{1}{12}$ of $\$14.40 = \1.20 (1 mo.).

15 da. $= \frac{1}{2}$ mo. $= \$0.60$

3 da. $= \frac{1}{3}$ 15 da. $= .12$

1 da. $= \frac{1}{3}$ 3 da. $= .04$

Int. for 19 da. $= \$0.76$, *Ans.*

(6.) $\$240 \times .07, \div 12 = \$1.40 = \text{int. 1 mo.}$

24 da. $= \frac{4}{5}$ mo. $= \$1.12$

3 da. $= \frac{1}{8}$ 24 da. $= .14$

Int. 27 da. $= \$1.26$, *Ans.*

(7.) $\$320 \times .05, \div 12 = \$1.33\frac{1}{3} = \text{int. 1 mo.}$

20 da. $= \frac{2}{3}$ mo. $= \$0.888 +$

1 da. $= \frac{1}{20}$ 20 da. $= .044 +$

Int. 21 da. $= \$0.93$, *Ans.*

(8.) $\$450 \times .10, \div 12 = \$3.75 = \text{int. 1 mo.}$: 25 da. $=$
 $\frac{5}{6}$ mo.: $\frac{5}{6}$ of $\$3.75 = \3.125 . *Ans.* $\$3.13$.

(9.) $\$100.80 \times .05, \div 12 = \$0.42 = \text{int. 1 mo.}$

25 da. $= \frac{5}{6}$ mo. $= \$0.35$

3 da. $= \frac{1}{10}$ mo. $= .042$

Int. 28 da. $= \$0.39, + \$100.80 = \$101.19$, *Ans.*

(10.) $\$150 \times .05, \div 12 = \$0.62\frac{1}{2}$: 18 da. $= \frac{3}{5}$ mo.: $\frac{3}{5}$ of
 $\$0.625 = \0.375 : $\$150 + \$0.375 = \$150.38$, *Ans.*

$$(11.) \$360 \times .06, \div 12 = \$1.80 = \text{int. 1 mo.}$$

$$10 \text{ da.} = \frac{1}{3} \text{ mo.} = \$0.60$$

$$1 \text{ da.} = \frac{1}{10} \quad 10 \text{ da.} = \underline{.06}$$

$$\text{Int. for 11 da.} = \$0.66, + \$360 = \$360.66, \text{ Ans.}$$

$$(12.) \$264 \times .06, \div 12 = \$1.32 = \text{int. 1 mo.}$$

$$6 \text{ da.} = \frac{1}{2} \text{ mo.} = \$0.264$$

$$3 \text{ da.} = \frac{1}{2} \quad 6 \text{ da.} = \underline{.132}$$

$$\text{Int. 9 da.} = \$0.40, + \$264 = \$264.40, \text{ Ans.}$$

$$(13.) \$900 \times .07 = \$63, \div 12 = \$5.25 = \text{int. 1 mo.}$$

$$10 \text{ da.} = \frac{1}{3} \text{ mo.} = \$1.75$$

$$3 \text{ da.} = \frac{1}{10} \text{ mo.} = \underline{.525}$$

$$1 \text{ da.} = \frac{1}{3} \quad 3 \text{ da.} = \underline{.175}$$

$$\text{Int. 14 da.} = \$2.45, + \$900 = \$902.45, \text{ Ans.}$$

$$(14.) \$430 \times .04\frac{1}{2}, \div 12 = \$1.61\frac{1}{4} = \text{int. 1 mo.}$$

$$15 \text{ da.} = \frac{1}{2} \text{ mo.} = \$0.806$$

$$3 \text{ da.} = \frac{1}{5} \quad 15 \text{ da.} = \underline{.161}$$

$$1 \text{ da.} = \frac{1}{3} \quad 3 \text{ da.} = \underline{.053}$$

$$\text{Int. 19 da.} = \$1.02, + \$430 = \$431.02, \text{ Ans.}$$

5th. When the time is years, months, and days, or any two of these periods.

$$(3.) \$150 \times .06 = \$9, \times 4 \text{ (yr.)} = \$36.00: 2 \text{ mo.} = \frac{1}{6} \text{ yr.: } \frac{1}{6} \text{ of } \$9 = \$1.50: \$36 + \$1.50 = \$37.50, \text{ Ans.}$$

$$(4.) \$375.40 \times .06 = \$22.524 \quad 8 \text{ mos.} = \frac{2}{3} \text{ yr.}$$

$$\frac{2}{3} \text{ of } \$22.524 = \underline{15.016}$$

$$\$37.54, \text{ Ans.}$$

$$(5.) \$92.75 \times .06 = \$5.565, \times 3 \text{ (yr.)} = \$16.695$$

$$4 \text{ mo.} = \frac{1}{3} \text{ yr.} \quad \frac{1}{3} \text{ of } 5.565 = \underline{1.855}$$

$$1 \text{ mo.} = \frac{1}{4} \quad 4 \text{ mo.} \quad \frac{1}{4} \text{ of } 1.855 = \underline{.46375}$$

$$\$19.01, \text{ Ans.}$$

$$(6.) \$500 \times .06 = \$30.00 = \text{int. 1 yr.}$$

$$\frac{1}{12} \text{ of } \$30.00 = 2.50 = \text{int. 1 mo.}$$

$$\frac{1}{2} \text{ of } 2.50 = 1.25 = \text{int. 15 da.}$$

$$\frac{1}{5} \text{ of } 1.25 = .25 = \text{int. 3 da.}$$

$$\underline{\$34.00, \text{ Ans.}}$$

$$(7) \$560 \times .08 = \$44.80, \times 2 = \$89.60 = \text{int. 2 yr.}$$

$$\frac{1}{3} \text{ of } 44.80 = 14.933+ = \text{int. 4 mo.}$$

$$\frac{1}{8} \text{ of } 14.933 = 1.866 = \text{int. 15 da.}$$

$$\underline{\$106.40, \text{ Ans.}}$$

$$(8.) \$750 \times .06 = \$45, \times 4 = \$180.00 = \text{int. 4 yr.}$$

$$3 \text{ mo.} = \frac{1}{4} \text{ yr.} \quad \frac{1}{4} \text{ of } \$45.00 = 11.25 = \text{int. 3 mo.}$$

$$\text{Int. 1 mo.} = \frac{1}{3} \text{ of } 11.25 = 3.75:$$

$$\frac{1}{5} \text{ of } 3.75 = .75 = \text{int. 6 da.}$$

$$\underline{\$192, \text{ Ans.}}$$

$$(9.) \$456 \times .05 = \$22.80, \times 3 = \$68.40 = \text{int. 3 yr.}$$

$$\frac{1}{12} \text{ of } \$22.80 = \$1.90, \frac{5}{12} = 9.50 = \text{int. 5 mo.}$$

$$\frac{1}{2} \text{ of } 1.90 = .95 = \text{int. 15 da.}$$

$$\frac{1}{5} \text{ of } .95 = .19 = \text{int. 3 da.}$$

$$\underline{\$79.04, \text{ Ans.}}$$

$$(10.) \$216 \times .10 = \$21.60, \times 5 = \$108.00 = \text{int. 5 yr.}$$

$$\frac{1}{12} \text{ of } \$21.60 = 1.80 (1 \text{ mo.}),$$

$$\frac{7}{12} \text{ of } 21.60 = 12.60 = \text{int. 7 mo.}$$

$$27 \text{ da.} = 3 \text{ da., or } \frac{1}{10} \text{ less than 1}$$

$$\text{mo.: } \frac{1}{10} \text{ of } 1.80 = .18: 1.80 - .18 = 1.62 = \text{int. 27 da.}$$

$$\underline{\$122.22, \text{ Ans.}}$$

$$(11.) \$380 \times .15 = \$57.00, \times 3 = \$171.00 = \text{int. 3 yr.}$$

$$9 \text{ mo.} = \frac{3}{4} \text{ yr.:} \quad \frac{3}{4} \text{ of } \$57 = 42.75 = \text{int. 9 mo.}$$

$$\frac{1}{12} \text{ of } \$57 = \$4.75 (1 \text{ mo.): } 9 \text{ da.}$$

$$= \frac{3}{10} \text{ mo.: } \frac{3}{10} \text{ of } \$4.75 = 1.425 = \text{int. 9 da.}$$

$$\underline{\$215.18, \text{ Ans.}}$$

$$\begin{aligned}
 (12.) \quad \$300 \times .06 &= \$18, \times 3 = \$54.00 = \text{int. 3 yr.} \\
 &\quad \frac{1}{2} \text{ of } \$18 = 9.00 = \text{int. 6 mo.} \\
 &\quad \frac{1}{3} \text{ of } 9 = 3.00 = \text{int. 2 mo.} \\
 \text{Int. 3 yr. 8 mo.} &= \underline{\$66.} \\
 &\quad \underline{300.} \\
 &\quad \$366, \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 (13.) \quad \$250 \times .06 &= \$15.00 = \text{int. 1 yr.} \\
 &\quad \frac{1}{2} \text{ of } \$15.00 = 7.50 = \text{int. 6 mo.} \\
 &\quad \frac{1}{6} \text{ of } 7.50 = 1.25 = \text{int. 1 mo.} \\
 &\quad \underline{\$23.75} \\
 &\quad \underline{250.00} \\
 &\quad \$273.75, \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 (14.) \quad \$205.25 \times .06 &= \$12.315, \times 2 = \$24.63 \text{ (2 yr.)} \\
 \text{Int. 6 mo.} &= \frac{1}{2} \text{ of } \$12.315 = 6.1575 \\
 \text{Int. 2 mo.} &= \frac{1}{3} \text{ of } 6.1575 = 2.0525 \\
 \text{Int. 15 da.} &= \frac{1}{4} \text{ of } 2.0525 = \underline{.5131} \\
 &\quad \underline{\$33.3531} \\
 &\quad \underline{205.25} \\
 &\quad \$238.60, \text{ Ans.}
 \end{aligned}$$

$$\begin{aligned}
 (15.) \quad \$150.62 \times .05 &= \$7.5310, \times 3 = \$22.5930 \text{ (3 yr.)} \\
 \text{Int. 4 mo.} &= \frac{1}{3} \text{ of } \$7.5310 = 2.5103 \\
 \text{Int. 1 mo.} &= \frac{1}{4} \text{ of } 2.5103 = .6275 \\
 \text{Int. 12 da.} &= \frac{2}{5} \text{ of } .6275 = \underline{.2510} \\
 &\quad \underline{\$25.9818} \\
 &\quad \underline{150.62} \\
 &\quad \$176.60, \text{ Ans.}
 \end{aligned}$$

$$(16.) \quad \$210.25 \times .07 = \$14.7175, \times 2 = \$29.4350 \quad (2 \text{ yr.})$$

$$\text{Int. 6 mo.} = \frac{1}{2} \text{ of } \$14.7175 = 7.3587$$

$$\text{Int. 1 mo.} = \frac{1}{6} \text{ of } 7.3587 = 1.2264$$

$$\text{Int. 20 da.} = \frac{2}{3} \text{ of } 1.2264 = .8176$$

$$\underline{\$38.8377}$$

$$\underline{210.25}$$

$$\$249.09, \text{ Ans.}$$

$$(17.) \quad \$57.85 \times .05 = \$2.8925, \times 2 = \$5.7850 \quad (2 \text{ yr.})$$

$$\text{Int. 3 mo.} = \frac{1}{4} \text{ of } \$2.8925 = .7231$$

$$\text{Int. 20 da.} = \frac{2}{3} \text{ of } \frac{1}{3} \text{ of } .7231 = .1606$$

$$\text{Int. 2 da.} = \frac{1}{10} \text{ of } .1606 = .0160$$

$$\text{Int. 1 da.} = \frac{1}{2} \text{ of } .0160 = .0080$$

$$\underline{\$6.6927}$$

$$\underline{57.85}$$

$$\$64.54, \text{ Ans.}$$

$$(18.) \quad \begin{array}{rcl} \text{yr.} & \text{mo.} & \text{da.} \\ 1849 & 4 & 19 \\ 1847 & 1 & 9 \\ \hline 2 & 3 & 10 \end{array}$$

$$\$150 \times .06 = \$9.00, \times 2 = \$18.00 = \text{int. 2 yr.}$$

$$\text{Int. 3 mo.} = \frac{1}{4} \text{ of } \$9.00 = 2.25$$

$$\text{Int. 10 da.} = \frac{1}{3} \text{ of } \frac{1}{3} \text{ of } 2.25 = .25$$

$$\underline{\$20.50, \text{ Ans.}}$$

$$(19.) \quad \begin{array}{rcl} \text{yr.} & \text{mo.} & \text{da.} \\ 1849 & 4 & 27 \\ 1848 & 2 & 15 \\ \hline 1 & 2 & 12 \end{array}$$

$$\$240 \times .08 = \$19.20 = \text{int. 1 yr.}$$

$$\frac{1}{6} \text{ of } \$19.20 = 3.20 = \text{int. 2 mo.}$$

$$\frac{2}{5} \text{ of } \frac{1}{2} \text{ of } 3.20 = .64 = \text{int. 12 da.}$$

$$\underline{\$23.04, \text{ Ans.}}$$

(20.)	yr.	mo.	da.
	1845	8	28
	1843	5	14
	<u>2</u>	<u>3</u>	<u>14</u>

$$\begin{aligned}
 \$180 \times .07 &= \$12.60, \times 2 = \$25.20 = \text{int. 2 yr.} \\
 \frac{1}{4} \text{ of } \$12.60 &= 3.15 = \text{int. 3 mo.} \\
 \frac{2}{5} \text{ of } \frac{1}{3} \text{ of } 3.15 &= .42 = \text{int. 12 da.} \\
 \frac{1}{6} \text{ of } .42 &= .07 = \text{int. 2 da.} \\
 &\quad \underline{\$28.84, \text{ Ans.}}
 \end{aligned}$$

(21.)	mo.	da.
	11	27
	<u>7</u>	<u>3</u>
		24

$$\begin{aligned}
 \$137.50 \times .09 &= \$12.3750 = \text{int. 1 yr.} \\
 \frac{1}{3} \text{ of } \$12.3750 &= \$4.125 = \text{int. 4 mo.} \\
 \frac{4}{5} \text{ of } \frac{1}{4} (= \frac{1}{5}) \text{ of } 4.125 &= \underline{.825} = \text{int. 24 da.} \\
 &\quad \underline{\$4.95, \text{ Ans.}}
 \end{aligned}$$

(22.)	mo.	da.
	8	28
	<u>3</u>	<u>1</u>
	5	27

$$\begin{aligned}
 \$125.40 \times .08\frac{1}{2} &= \$10.659 = \text{int. 1 yr.} \\
 \frac{5}{12} \text{ of } \$10.659 &= \$4.44 + = \text{int. 5 mo.} \\
 \frac{9}{10} \text{ of } \frac{1}{3} \text{ of } 4.44 &= \underline{.799} + = \text{int. 27 da.} \\
 &\quad \underline{\$5.24} \\
 &\quad \underline{125.40} \\
 &\quad \underline{\$130.64, \text{ Ans.}}
 \end{aligned}$$

(23.)	yr.	mo.	da.
	1848	3	9
	1847	8	2
	<hr/>		
		7	7

$$\$234.60 \times .05\frac{1}{4} = \$12.3165 = \text{int. 1 yr.}$$

$$\begin{aligned} \frac{7}{12} \text{ of } \$12.3165 &= \$7.1848 = \text{int. 7 mo.} \\ \frac{1}{5} \text{ of } \frac{1}{12} \text{ of } 12.3165 &= .2052 = \text{int. 6 da.} \\ \frac{1}{6} \text{ of } .2052 &= .0342 = \text{int. 1 da.} \\ &\underline{\$7.4242} \\ &234.60 \\ &\hline &\$242.02, \text{ Ans.} \end{aligned}$$

(24.)	yr.	mo.	da.
	1847	7	24
	1846	10	25
	<hr/>		
		8	29

$$\$153.80 \times .05 = \$7.69 = \text{int. 1 yr.}$$

$$\begin{aligned} \frac{2}{3} \text{ of } \$7.69 &= \$5.126 = \text{int. 8 mo.} \\ \text{Int. 1 mo.} &= \frac{1}{8} \text{ of } \$5.126 = .64 \\ \text{Int. 29 da.} &= .64 \text{ less } \frac{1}{30} = \underline{.62} \\ &\underline{\$5.75} \\ &153.80 \\ &\hline &\$159.55, \text{ Ans.} \end{aligned}$$

Art. 184. 1ST PROCESS.

$$(5.) \text{ 1 yr. 4 mo.} = 16 \text{ mo.} \quad \text{Ans. 16 ct.}$$

$$(6.) \text{ 1 yr. 5 mo.} = 17 \text{ mo.: } \frac{1}{3} \text{ of } 27 \text{ da.} = 9. \quad \text{Ans. } \$0.179$$

$$(7.) \text{ 2 yr. 3 mo.} = 27 \text{ mo.: } \frac{1}{3} \text{ of } 21 \text{ da.} = 7. \quad \text{Ans. } \$0.277$$

$$(8.) \text{ 3 yr. 7 mo.} = 43 \text{ mo.: } \frac{1}{3} \text{ of } 12 \text{ da.} = 4. \quad \text{Ans. } \$0.434$$

(9.) 4 yr. 2 mo. = 50 mo.: $\frac{1}{3}$ of 15 da. = 5 da. *Ans.* \$0.505

(10.) 2 ct. for the 2 mo., and $\frac{1}{3}$ mill for the 1 da. *Ans.* \$0.020 $\frac{1}{3}$

(11.) $\frac{1}{3}$ of 17 = 5 $\frac{2}{3}$ (apply rule). *Ans.* \$0.055 $\frac{2}{3}$

(12.) $\frac{1}{3}$ of 13 = 4 $\frac{1}{3}$ (apply rule). *Ans.* \$0.104 $\frac{1}{3}$

(13.) 1 yr. 2 mo. = 14 mo.: $\frac{1}{3}$ of 4 = 1 $\frac{1}{3}$. *Ans.* \$0.141 $\frac{1}{3}$

(14.) 2 yr. 9 mo. = 33 mo.: $\frac{1}{3}$ of 20 = 6 $\frac{2}{3}$. *Ans.* \$0.336 $\frac{2}{3}$

(15.) 3 yr. 5 mo. = 41 mo.: $\frac{1}{3}$ of 29 = 9 $\frac{2}{3}$. *Ans.* \$0.419 $\frac{2}{3}$

2D PROCESS.

(3.) Int. on \$1 for 7 mo. 24 da. @ 12% = \$0.078: int. for 7 mo. 24 da. @ 6% = $\frac{1}{2}$ of \$0.078 = \$0.039, *Ans.*

(4.) Int. at 12% = \$0.105

Int. at 4% = $\frac{1}{3}$ of \$0.105 = \$0.035

Int. at 1% = $\frac{1}{4}$ of .035 = .00875

\$0.043 $\frac{3}{4}$, *Ans.*

(5.) Int. at 12% = \$0.116: int. at 9% = $\frac{3}{4}$ of \$0.116 = \$0.087, *Ans.*

(6.) 1 yr. 2 mo. = 14 mo.: int. 14 mo. 9 da. @ 12% = \$0.143: int. @ 6% = $\frac{1}{2}$ of \$0.143 = \$0.071 $\frac{1}{2}$, *Ans.*

(7.) 2 yr. 5 mo. = 29 mo.: int. 29 mo. 12 da. @ 12% = \$0.294: int. @ 8% = $\frac{2}{3}$ of \$0.294 = \$0.196, *Ans.*

(8.) 3 yr. 10 mo. = 46 mo.: int. 46 mo. 17 da. @ 12% = \$0.465 $\frac{2}{3}$: int. @ 10% = $\frac{5}{6}$ of \$0.465 $\frac{2}{3}$ = \$0.388 $\frac{1}{8}$, *Ans.*

(9.) 4 yr. 3 mo. = 51 mo.: int. 51 mo. 11 da. @ 12% = \$0.513 $\frac{2}{3}$

Int. @ 6% = $\frac{1}{2}$ of \$0.513 $\frac{2}{3}$ = \$0.256 $\frac{5}{6}$

Int. @ 1% = $\frac{1}{6}$ of .256 $\frac{5}{6}$ = .042 $\frac{23}{66}$

\$0.299 $\frac{23}{66}$, *Ans.*

(10.) 5 yr. 7 mo. = 67 mo.: int. 67 mo. 24 da. @ 12% = \$0.678: int. @ 4% = $\frac{1}{3}$ of \$0.678 = \$0.225, *Ans.*

3D PROCESS.

(3.) Int. \$1 for 6 mo. 21 da. @ 12% = \$0.067: @ 6% = $\frac{1}{2}$ of \$0.067 = \$0.0335, $\times 40 = \$1.34$, *Ans.*

(4.) Int. \$1 for 8 mo. 24 da. @ 12% = \$0.088: int. \$1 for 8 mo. 24 da. @ 9% = $\frac{3}{4}$ of \$0.088 = \$0.066: \$0.066 $\times 50 = \$3.30$, *Ans.*

(5.) Int. \$1 for 10 mo. 12 da. @ 12% = \$0.104
 Int. \$1 for 10 mo. 12 da. @ 6% = $\frac{1}{2}$ of \$0.104 = \$0.052
 Int. \$1 for 10 mo. 12 da. @ 1% = $\frac{1}{6}$ of .052 = $\frac{.008\frac{2}{3}}{.008\frac{2}{3}}$
 $\$0.060\frac{2}{3} \times 120 = \7.28 , *Ans.*

(6.) Int. \$1 for 11 mo. 15 da. @ 12% = \$0.115: int. \$1 for 11 mo. 15 da. @ 6% = $\frac{1}{2}$ of \$0.115 = \$0.0575: \$0.0575 $\times 200 = \$11.50$, *Ans.*

(7.) 1 yr. 3 mo. = 15 mo.: int. \$1 for 15 mo. 6 da. @ 12% = \$0.152: at 3% = $\frac{1}{4}$ of \$0.152 = \$0.038: \$0.038 $\times 500 = \$19$, *Ans.*

(8.) 1 yr. 5 mo. = 17 mo.: int. \$1 for 17 mo. 27 da. @ 12% = \$0.179: at 8% = $\frac{2}{3}$ of \$0.179 = \$0.119 $\frac{1}{3}$: \$0.119 $\frac{1}{3}$ $\times 750 = \$89.50$, *Ans.*

(9.) 1 yr. 9 mo. = 21 mo.: int. \$1 for 21 mo. 3 da. @ 12% = \$0.211: @ 6% = $\frac{1}{2}$ of \$0.211 = \$0.105 $\frac{1}{2}$, $\times 48.75 = \$5.14$, *Ans.*

(10.) 1 yr. 10 mo. = 22 mo.: Int. \$1 for 22 mo. 25 da. @ 12% = \$0.228 $\frac{1}{3}$: at 4% = $\frac{1}{3}$ of \$0.228 $\frac{1}{3}$ = \$0.076 $\frac{1}{3}$: \$0.076 $\frac{1}{3}$ $\times 76.32 = \$5.81$, *Ans.*

(11.) 2 yr. 1 mo. = 25 mo.: int. \$1 for 25 mo. 9 da. @ 12% = \$0.253: at 4% = $\frac{1}{3}$ of \$0.253 = \$0.084 $\frac{1}{3}$: 1% = $\frac{1}{4}$

of $\$0.084\frac{1}{3} = \$0.021\frac{1}{12}$: $\$0.084\frac{1}{3} + \$0.021\frac{1}{12} = \$0.105\frac{5}{12}$, $\times 600 = \$63.25$: $\$600 + \$63.25 = \$663.25$, *Ans.*

(12.) 2 yr. 4 mo. = 28 mo.: int. \$1 @ 12% for 28 mo. 10 da. = $\$0.283\frac{1}{3}$: @ 6% = $\frac{1}{2}$ of $\$0.283\frac{1}{3} = \$0.141\frac{2}{3}$, $\times 900 = \$127.50$: $\$900 + \$127.50 = \$1027.50$, *Ans.*

(13.) 2 yr. 7 mo. = 31 mo.: int. \$1 @ 12% for 31 mo. 17 da. = $\$0.315\frac{2}{3}$: 9% = $\frac{3}{4}$ of 12% = $\$0.236\frac{3}{4}$: $\$0.236\frac{3}{4} \times 86.25 = \$20.419+$: $\$86.25 + \$20.42 = \$106.67$, *Ans.*

(14.) 3 yr. 2 mo. = 38 mo.: int. \$1 for 38 mo. 13 da. @ 12% = $\$0.384\frac{1}{3}$: 8% = $\frac{2}{3}$ of 12% = $\$0.256\frac{2}{3}$, $\times 450 = \$115.30$: $\$450 + \$115.30 = \$565.30$, *Ans.*

(15.) 3 yr. 5 mo. = 41 mo.: int. \$1 for 41 mo. 22 da. @ 12% = $\$0.417\frac{1}{3}$: 4% = $\frac{1}{3}$ of 12% = $\$0.139\frac{1}{3}$: $\$0.139\frac{1}{3} \times 534.78 = \$74.39+$: $\$534.78 + \$74.39 = \$609.17$, *Ans.*

(16.) 3 yr. 11 mo. = 47 mo.: int. \$1 @ 12% for 47 mo. 15 da. = $\$0.475$: int. @ 10% = $\frac{5}{6}$ of 12% = $\$0.395\frac{5}{6}$: $\$0.395\frac{5}{6} \times 1200 = \475 , $+ \$1200 = \1675 , *Ans.*

Art. 185.

(4.) Int. on \$200 for 1 yr. @ 6% = \$12.00: $36 \div 12 = 3$. *Ans.* 3 yr.

(5.) Int. on \$60 for 1 yr. @ 5% = \$3.00: $\$72 - \$60 = \$12$: $12 \div 3 = 4$. *Ans.* 4 yr.

(6.) If the principal is doubled, the int. will equal 100%. $100\% \div 6\% = 16\frac{2}{3}$: $\frac{2}{3}$ yr. = 8 mo. *Ans.* 16 yr 8 mo.

(7.) Int. on \$375 for 1 yr. @ 8% = \$30: $90 \div 30 = 3$. *Ans.* 3 yr.

(8.) Int. on \$600 @ 9% for 1 yr. = \$54: $\$798 - \$600 = \$198$: $198 \div 54 = 3\frac{2}{3} = 3$ yr. 8 mo., *Ans.*

(9.) $100(\%) \div 10(\%) = 10$. *Ans.* 10 yr.

(10.) Int. on \$250 for 1 yr. @ 6% = \$15: $34.50 \div 15 = 2.30$ or $2\frac{3}{10}$ yr.: $\frac{3}{10}$ yr. = $3\frac{3}{5}$ mo.: $\frac{3}{5}$ mo. = 18 da.
Ans. 2 yr. 3 mo. 18 da.

(11.) The int. on \$60 for 1 yr. @ 6% = \$3.60: \$73.77 — \$60 = \$13.77: $13.77 \div 3.60 = 3.825$ or $3\frac{33}{40}$ yr.: $\frac{33}{40}$ yr. = $9\frac{9}{10}$ mo.: $\frac{9}{10}$ mo. = 27 da. *Ans.* 3 yr. 9 mo. 27 da.

(12.) If the principal is trebled, the int. will equal 200%. $200(\%) \div 6(\%) = 33\frac{1}{3}$: $\frac{1}{3}$ yr. = 4 mo. *Ans.* 33 yr. 4 mo.

(13.) Int. on \$400 for 1 yr. @ 7% = \$28: $68.60 \div 28 = 2.45$ or $2\frac{9}{20}$ yr.: $\frac{9}{20}$ yr. = $5\frac{4}{10}$ mo.: $\frac{4}{10}$ mo. = 12 da.
Ans. 2 yr. 5 mo. 12 da.

(14.) Int. on \$700 for 1 yr. @ 9% = \$63: \$924.70 — \$700 = \$224.70: $224.70 \div 63 = 3.566+$ or $3\frac{57}{100}$ yr.: $\frac{57}{100}$ yr. = $6\frac{79}{100}$ mo.: $\frac{79}{100}$ mo. = $23\frac{9}{10}$ da. *Ans.* 3 yr. 6 mo. 24 da.

(15.) If the principal is increased one half, the int. will equal 50%. $50(\%) \div 8(\%) = 6\frac{1}{4}$: $\frac{1}{4}$ yr. = 3 mo. *Ans.* 6 yr. 3 mo.

(16.) Int. on \$1200 for 1 yr. @ 10% = \$120: \$1675 — \$1200 = \$475: $475 \div 120 = 3.959+$ or $3\frac{96}{100}$ yr.: $\frac{96}{100}$ yr. = $11\frac{52}{100}$ mo.: $\frac{52}{100}$ mo. = $15+$ da. *Ans.* 3 yr. 11 mo. 15 da.

Art. 186.

(3.) $\$48 \div 2 = \$24 = \text{int. 1 yr.}$: $24 \div 600 = .04 = 4\%$, *Ans.*

(4.) 2 yr. 6 mo. = $2\frac{1}{2}$ or $\frac{5}{2}$ yr. If int. for $\frac{5}{2}$ yr. = \$200, for $\frac{1}{2}$ yr. = \$40, and for 1 yr. = \$80: $80 \div 1000 = .08 = 8\%$, *Ans.*

(5.) 2 yr. 4 mo. 24 da. = $2\frac{2}{3}$ or $\frac{1}{3}$ yr.: \$310 — \$250 = \$60. If int. for $\frac{1}{3}$ yr. = \$60, for $\frac{1}{3}$ yr. = \$5, and for 1 yr. = \$25: $25 \div 250 = .10 = 10\%$, *Ans.*

(6.) $\$23.40 \div 2 = \$11.70 = \text{int. 1 yr.}$: $11.70 \div 260 = .04\frac{1}{2} = 4\frac{1}{2}\%$, *Ans.*

(7.) Since the int. for $12\frac{1}{2}$ or $2\frac{5}{2}$ yr. is 100%, for $\frac{1}{2}$ yr. it is $\frac{100}{25}$ or 4% and for 1 yr. = 8%, *Ans.*

(8.) $\$250.25 - \$175 = \$75.25$: 3 yr. 7 mo. = $3\frac{7}{12}$ or $4\frac{3}{12}$ yr. Since \$75.25 = int. for $4\frac{3}{12}$ yr., for $\frac{1}{12}$ yr. = $\$75.25 \div 43 = \1.75 , and for 1 yr. = $\$1.75 \times 12 = \21 : $21 \div 175 = .12 = 12\%$, *Ans.*

(9.) 1 yr. 8 mo. 12 da. = $1\frac{7}{10}$ or $\frac{17}{10}$ yr.: $\$61.20 \div 17 = \3.60 , $\times 10 = \$36 = \text{int. 1 yr.}$: $36 \div 450 = 0.08 = 8\%$, *Ans.*

(10.) 11 yr. 1 mo. 10 da. = $11\frac{1}{9}$ or $\frac{100}{9}$ yr. Since the int. for $\frac{100}{9}$ yr. = 100%, for $\frac{1}{9}$ yr. = 1%, and for 1 yr. = 9%, *Ans.*

(11.) $\$746.20 - \$650 = \$96.20$: 2 yr. 5 mo. 18 da. = $2\frac{7}{15}$ or $3\frac{7}{15}$ yr.: $\$96.20 \div 37 = \2.60 , $\times 15 = \$39 = \text{int. 1 yr.}$: $39 \div 650 = .06 = 6\%$, *Ans.*

(12.) $\$110.40 \div 6 = \$18.40 = \text{int. 1 yr.}$: $18.40 \div 640 = .02\frac{7}{8} = 2\frac{7}{8}\%$, *Ans.*

Art. 187.

(3.) The int. of \$1 for 3 yr. at 5% is 15 ct. It will take as many dollars to gain \$8.25 int. as 15 ct. are contained times in \$8.25 = 55 times. *Ans.* \$55.

(4.) Int. of \$1 for 3 yr. at 5% = 15 ct.: $\$341.25 \div .15 = \2275 , *Ans.*

(5.) 1 yr. 4 mo. = $1\frac{1}{3}$ yr.: 6% for 1 yr. = .06, and for $1\frac{1}{3}$ yr. = .08: $\$226 \div .08 = \28.25 , *Ans.*

(6.) Int. of \$1 = 5 ct.: $\$1023.75 \div .05 = \20475 , *Ans.*

(7.) The int. of \$1 for 1 yr. 6 mo. 27 da. at 12% = \$0.189: at 8% the int. is $\frac{2}{3}$ of \$0.189 = \$0.126: $\$30.24 \div .126 = \240 , *Ans.*

(8.) Int. of \$1 for 12 yr. 3 mo. 20 da. at 12% = \$1.476 $\frac{2}{3}$: at 9% = $\frac{3}{4}$ of \$1.476 $\frac{2}{3}$ = \$1.1075: $\$525.40 \div 1.1075 = \474.40 , *Ans.*

(9.) Int. at 12% on \$1 for 2 yr. 7 mo. 11 da. is \$0.313 $\frac{2}{3}$: at 4% it is $\frac{1}{3}$ of \$0.313 $\frac{2}{3}$ = \$0.104 $\frac{5}{9}$: $\$9.41 \div .104\frac{5}{9} = \90 , *Ans.*

(10.) The int. of \$1 for 5 yr. 8 mo. 24 da. at 12% is \$0.688: at 6% it is $\frac{1}{2}$ of \$0.688 = \$0.344: $\$28.38 \div .344 = \82.50 , *Ans.*

Art. 188.

(2.) $9 \text{ yr.} \times .05 = .45$: $\$435 \div 1.45 = \300 , *Ans.*

(3.) $4 \text{ yr.} \times .05 = .20$: $\$571.20 \div 1.20 = \476 = principal: $\$571.20 - \$476 = \$95.20$, *Ans.*

(4.) $6 \text{ yr.} \times .07 = 0.42$: $\$532.50 \div 1.42 = \375 : $\$532.50 - \$375 = \$157.50$, *Ans.*

(5.) $2 \text{ yr. } 9 \text{ mo.} = 2\frac{3}{4} \text{ yr.}$: $2\frac{3}{4} \times .08 = 0.22$: $\$285.48 \div 1.22 = \234 , *Ans.*

(6.) $2\frac{1}{2} \text{ yr.} \times .06 = 0.15$: $\$690 \div 1.15 = \600 : $\$690 - \$600 = \$90$, *Ans.*

(7.) $3 \text{ yr. } 4 \text{ mo. } 24 \text{ da.} = 3\frac{2}{3} \text{ yr.}$: $3\frac{2}{3} \times .07 = 0.238$: $\$643.760 \div 1.238 = \520 , *Ans.*

(8.) $4 \text{ yr. } 3 \text{ mo. } 27 \text{ da.} = 5\frac{1}{2}\frac{9}{10} \text{ yr.}$: $5\frac{1}{2}\frac{9}{10} \times .04 = 0.173$: $\$914.940 \div 1.173 = \780 = principal: $\$914.94 - \$780 = \$134.94$, *Ans.*

COMPOUND INTEREST.

Art. 190.

(2)	\$500	530	561.80
	<u>.06</u>	<u>.06</u>	<u>.06</u>
	30.00	31.80	33.7080
	<u>500</u>	<u>530</u>	<u>561.80</u>
	\$530, 1st yr.	\$561.80, 2d yr.	Ans. \$595.51

(3)	\$800	848	898.88	952.81
	<u>.06</u>	<u>.06</u>	<u>.06</u>	<u>.06</u>
	48.00	50.88	53.9328	57.1686
	<u>800</u>	<u>848</u>	<u>898.88</u>	<u>952.81</u>
	\$848, 1st yr.	\$898.88, 2d yr.	\$952.81, 3d yr.	\$1009.98, Ans.

(4)	\$250	15.90
	<u>.06</u>	<u>265</u>
	\$15.00 = 1st yr.	\$280.90
	<u>250</u>	<u>.06</u>
	265	\$16.8540 = 3d yr.
	<u>.06</u>	
	\$15.90 = 2d yr.	\$15 + \$15.90 + \$16.85 = \$47.75, Ans.

(5)	\$300	330.75
	<u>.05</u>	<u>.05</u>
	\$15.00 = 1st yr.	\$16.5375 = 3d yr.
	<u>300</u>	<u>330.75</u>
	315	347.29
	<u>.05</u>	<u>.05</u>
	\$15.75 = 2d yr.	\$17.3645 = 4th yr.
	<u>315</u>	
	\$330.75	\$15 + \$15.75 + \$16.54 + \$17.36 = \$64.65, Ans.

(5)	\$200	212.18
	<u>.03</u>	<u>.03</u>
	\$6.00 = 1st hf.-yr.	\$6.3654 = 3d hf.-yr.
	<u>200</u>	<u>212.18</u>
	206	218.55
	<u>.03</u>	<u>.03</u>
	\$6.18 = 2d hf.-yr.	\$6.5565 = 4th hf.-yr.
	<u>206</u>	
	\$212.18	\$6 + \$6.18 + \$6.36 + \$6.56 = \$25.10, <i>Ans.</i>

(7.) 20% annually = 5% quarterly.

1st qr., $\$500 \times .05 = \25 , + $\$500 = \525 :

2d qr., $\$525 \times .05 = \26.25 , + $\$525 = \551.25 :

3d qr., $\$551.25 \times .05 = \27.56 , + $\$551.25 = \578.81 :

4th qr., $\$578.81 \times .05 = \28.94 , + $\$578.81 = \607.75 :

5th qr., $\$607.75 \times .05 = \30.39 , + $\$607.75 = \638.14 :

6th qr., $\$638.14 \times .05 = \31.91 , + $\$638.14 = \670.05 :

7th qr., $\$670.05 \times .05 = \33.50 , + $\$670.05 = \703.55 :

8th qr., $\$703.55 \times .05 = \35.18 , + $\$703.55 = \738.73 , *Ans.*

(8.) Int. on \$300, 1 yr. @ 6% = \$18, + \$300 = \$318 :

int. on \$318 for 1 yr. @ 6% = \$19.08, + \$318 = \$337.08 :

int. on \$337.08, $\frac{1}{2}$ yr. @ 6% = \$10.11, + \$337.08 = \$347.19 :

\$347.19 — \$300 = \$47.19, *Ans.*

(9.) Int. on \$1000, 1 yr. @ 6% = \$60, + \$1000 = \$1060 :

int. on \$1060, 1 yr. @ 6% = \$63.60, + \$1060 = \$1123.60 :

int. on \$1123.60 for $8\frac{1}{2}$ mo. @ 6% = \$47.75, + \$1123.60 =

\$1171.35 : \$1171.35 — \$1000 = \$171.35, *Ans.*

(10.) 6% int. annually = 3% semi-annually.

Int. 6 mo. on \$620 @ 3% = \$18.60, + \$620 = \$638.60 :

int. 6 mo. on \$638.60 @ 3% = \$19.16, + \$638.60 = \$657.76 :

int. 6 mo. on \$657.76 @ 3% = \$19.73, + \$657.76 = \$677.49 :

int. 6 mo. on \$677.49 @ 3% = \$20.32, + \$677.49 = \$697.81 :

int. 6 mo. on \$697.81 @ 3% = \$20.93, + \$697.81 = \$718.74;
 int. 6 mo. on \$718.74 @ 3% = \$21.56, + \$718.74 = \$740.31;
 int. 6 mo. on \$740.31 @ 3% = \$22.21, + \$740.30 = \$762.52,
Ans.

(1st.—Compound Interest.)

(11.) 1st yr., int. on \$500 @ 6% = \$30, + \$500 = \$530 :
 2d yr., int. on \$530 @ 6% = \$31.80, + \$530 = \$561.80 :
 3d yr., int. on \$561.80 @ 6% = \$33.71, + \$561.80 =
 \$595.51 : 4th yr., int. on \$595.51 @ 6% = \$35.73, + \$595.51
 = \$631.24 : 8 mo. = $\frac{2}{3}$ yr., int. on \$631.24 @ 6% = \$25.25,
 + \$631.24 = \$656.49 : \$656.49 — \$500 = \$156.49

(2d.—Simple Interest.)

Int. on \$500 for 1 yr. @ 6% = \$30 : int. on \$500 for $4\frac{2}{3}$
 yr. = \$140. \$156.49 — \$140 = \$16.49, *Ans.*

ANNUAL INTEREST.

Art. 191.

(2.) Int. @ 8% on \$800 for 3 yr. = \$192.00
 Int. @ 8% on \$800 for 1 yr. = \$64

Int. on annual int. 1 yr. = \$5.12

Int. on annual int. 3 yr. = \$15.36 . . 15.36

Total interest, \$207.36

Add principal, 800.00

Ans. \$1007.36

(3.) Int. on \$750 for 3 yr. @ 10% = \$225.00

Annual int. = \$75.00

Int. on annual int. = 7.50

Int. on an. int. 2 + 1, or 3, yr. = 22.50

\$247.50

Add principal, 750.00

Ans. \$997.50

(4.) Int. on \$10000 for 4 yr. @ 5% = \$2000.

Annual int. = \$500

Int. on annual int. = 25

Int. on an. int. $3 + 2 + 1$, or 6, yr. = 150.

Ans. \$2150.

(5.) yr. mo. da.

1877 9 1

1875 6 1

2 3 = $2\frac{1}{4}$ yr.

Int. on \$500 for 1 yr. @ 6% = \$30.00

Int. on \$500 for $2\frac{1}{4}$ yr. @ 6% = 67.50 . . \$67.50

Each semi-annual int. = 15.00

Interest on int. each half-yr. = .45

Interest on int. $3\frac{1}{2} + 2\frac{1}{2} + 1\frac{1}{2} + \frac{1}{2}$, or 8, half-yr. . . 3.60

Total interest, \$71.10

Add principal, 500.00

Ans. \$571.10

(6.) yr. mo. da.

1877 9 20

1873 5 12

4 4 8 = $4\frac{1}{4}\frac{2}{3}$ yr.

Int. on \$1200 for 1 yr. @ 6% = \$72.00

Int. on \$1200 for $4\frac{1}{4}\frac{2}{3}$ yr. @ 6% = 313.60 . . \$313.60

Int. on annual int. 1 yr. = 4.32

Int. on an. int. $3\frac{1}{4}\frac{2}{3} + 2\frac{1}{4}\frac{2}{3} + 1\frac{1}{4}\frac{2}{3} + \frac{1}{4}\frac{2}{3}$, or $7\frac{1}{4}\frac{2}{3}$, yr. = 32.06

Total interest, \$345.66

Add principal, 1200.00

Ans. \$1545.66

(7.) yr. mo. da.

1877 5 1

1872 10 10

4 6 21 = $4\frac{6}{12}\frac{7}{10}$ yr.

Int. on \$1500 for 1 yr. @ 5% = \$75.00

Int. on \$1500 for $4\frac{67}{120}$ yr. @ 5% = 341.88 .. \$341.88

Int. on an. int. 1 yr. = 3.75

Int. on an. int. $3\frac{67}{120} + 2\frac{67}{120} + 1\frac{67}{120} + \frac{67}{120}$, or

$8\frac{7}{30}$, yr. = 30.87

Total interest, \$372.75

Add principal, 1500.00

Ans. \$1872.75

(8.) Simple int. 1 yr. on \$1000 @ 6% = \$60: 5 yr. = \$300: int. on int. 1 yr. = \$3.60: for 4 + 3 + 2 + 1, or 10, yr. = \$36.00: annual int. = \$336; simple int. = \$300; difference = \$36, *Ans.*

(9.) $\$500 \times 6 = \3000

Int. on \$3000 for 1 yr. @ 6% = \$180.00

Int. on \$3000 for 3 yr. @ 6% = 540.00 .. \$540.00

Int. on int. $\frac{1}{2}$ yr. = 2.70

Int. on int. 5 + 4 + 3 + 2 + 1, or 15, half-yr. = 40.50

Total interest, \$580.50

Add principal, 3000.00

Ans. \$3580.50

(10.) Int. on \$20000 for 5 yr. @ 4% = \$4000.00

Int. on \$20000 for 1 yr. = \$800.00

Int. on \$20000 for $\frac{1}{4}$ yr. = 200.00

Int. on $\frac{1}{4}$ an. int. @ $11\frac{1}{2}\%$ ($\frac{1}{4}$ of 6%) = 3.00

Int. on $\frac{1}{4}$ an. int. 19 + 18 + 17 + 16 + 15 + 14 +

13 + 12 + 11 + 10 + 9 + 8 + 7 + 6

+ 5 + 4 + 3 + 2 + 1, or 190, qrs. = 570.00

Total interest, \$4570.00

Add to this the premium on gold, 5%, = $\frac{1}{20}$, 228.50

Ans. \$4798.50

Art. 192.

yr.	mo.	da.	(2)
1876	3	1 . . \$44	\$350
1875	7	1	14=int. 8 mo.
	8 mo.		\$364
1876	10	1 . . \$10	44
1876	3	1	\$320
	7 mo.		16=int. 7+3=10 mo.
1877	1	1 . . \$26	\$336
1876	10	1 \$36 . .	36
	3 mo.		\$300
1877	12	1 . . \$15	21.75=int. 11+3½=14½ mo.
1877	1	1	\$321.75
	11 mo.		15.00
1878	3	16	\$306.75, Ans.
1877	12	1	
	3	15=3½ mo.	

(3.) Amt. of \$200, 1 yr. @ 6% = \$212: \$212 - \$70 = \$142: amt. of \$142, 1 yr. @ 6% = \$150.52, Ans.

			(4)	
1874	1	1 . . \$109	6% per yr. = 3% per ½ yr.	
1873	7	1	\$300	\$6.00
	6 mo.		.03	200
			9.00	206
1874	7	1	300	100
1874	1	1	309	106
	6 mo.		109	.03
1875	1	1	200	3.18
1874	7	1	.03	106
	6 mo.		6.00	\$109.18, Ans

(5)

1871	9	10	.. \$32
1870	5	10	
<hr/>			
1 yr. 4 mo.			
1872	9	10	.. \$6.80
1871	9	10	
<hr/>			
1 yr.			
1872	11	10	
1872	9	10	
<hr/>			
2 mo.			

\$150
<u>12</u> = int. for 1 yr. 4 mo.
162
<u>32</u>
130
9.10 = int. 1 yr. 2 mo.
139.10
6.80
\$132.30, <i>Ans.</i>

(6)

1872	6	5	.. \$20
1871	3	5	
<hr/>			
1 yr. 3 mo.			
1872	12	5	.. \$50.50
1872	6	5	<u>\$70.50</u>
<hr/>			
6 mo.			
1874	6	5	
1872	12	5	
<hr/>			
1 yr. 6 mo.			

\$200
<u>35</u> = int. 1 yr. 9 mo.
235
<u>70.50</u>
164.60
<u>24.68</u> = int. 1 yr. 6 mo.
\$189.18, <i>Ans.</i>

(7)

1875	6	1	.. \$6
1875	1	1	
<hr/>			
5 mo.			
1876	1	1	.. \$21.50
1875	6	1	<u>\$27.50</u>
<hr/>			
7 mo.			
1876	7	1	
1876	1	1	
<hr/>			
6 mo.			

\$250
<u>17.50</u> = int. 12 mo.
267.50
<u>27.50</u>
240
<u>8.40</u> = int. 6 mo.
\$248.40, <i>Ans.</i>

(8)

1875	2	1 .. \$25.40
1874	8	1

6 mo.

1875	8	1 .. \$4.30
1875	2	1

6 mo.

1876	1	1 .. \$30
1875	8	1 \$34.30

5 mo.

1876	7	1
1876	1	1

6 mo.

\$180

5.40 = int. 6 mo.

185.40

25.40

160

8.80 = int. 11 mo.

168.80

34.30

134.50

4.035 = int. 6 mo.\$138.54, *Ans.*

(9)

1875	9	1 .. \$10
1875	3	1

6 mo.

1876	1	1 .. \$30
1875	9	1 \$40.

4 mo.

1876	7	1 .. \$11
1876	1	1

6 mo.

1876	9	1 .. \$80
1876	7	1 \$91.

2 mo.

1877 3 1

1876 9 1

6 mo.

\$400

20 = int. 10 mo. (6+4.)

420

40

380

15.10 = int. 8 mo. (6+2.)

395.20

91

304.20

9.126 = int. 6 mo.\$313.33, *Ans.*

(10)

1877	1	1 .. \$20
1876	4	16

8 mo. 15 da.

1877	4	1 .. \$14
------	---	-----------

1877	1	1
------	---	---

3 mo.

1877	7	16 .. \$31
------	---	------------

1877	4	1
------	---	---

\$65

3 mo. 15 da.

1877	12	25 .. \$10
------	----	------------

1877	7	16
------	---	----

5 mo. 9 da.

1878	7	4 .. \$18
------	---	-----------

1877	12	25
------	----	----

\$28

6 mo. 9 da.

1879	6	1
------	---	---

1878	7	4
------	---	---

10 mo. 27 da.

\$450 + \$45 (int. 8 mo. 15 da. + 3 mo. + 3 mo. 15 da.) =
 \$495: \$495 - \$65 = \$430: \$430 + \$64.50 (int. 5 mo. 9
 da. + 6 mo. 9 da. + 10 mo. 27 da.) = \$494.50: \$494.50 -
 \$28 = \$466.50, *Ans.*

(11)

1870	5	1 .. \$18
------	---	-----------

1870	1	1
------	---	---

4 mo.

1870	9	4 .. \$20
------	---	-----------

1870	5	1
------	---	---

4 mo. 3 da.

1870	12	16 .. \$15
------	----	------------

1870	9	4
------	---	---

3 mo. 12 da.

1871	4	10 .. \$21
------	---	------------

1870	12	16
------	----	----

3 mo. 24 da.

1871	7	13 .. \$118
------	---	-------------

1871	4	10
------	---	----

\$192

3 mo. 3 da.

1871	12	23 .. \$324
------	----	-------------

1871	7	13
------	---	----

5 mo. 10 da.

1873	10	1
------	----	---

1871	12	23
------	----	----

1 yr. 9 mo. 8 da.

\$1000

92 = int. 18 mo. 12 da.

1092

192

900

24 = int. 5 mo. 10 da.

924

324

600

63.80 = int. 1 yr. 9 mo. 8 da.

\$663.80, *Ans.*

Art. 193.

(1.) Int. \$320, 1 yr. @ 6% = \$19.20

Amount = \$339.20

Amt. of \$50, 8 mo. @ 6% = \$52.00

Amt. of \$100, $1\frac{1}{2}$ mo. @ 6% = 100.75 152.75Balance due, \$186.45, *Ans.*

(2.) Time from March 1, 1877, to Jan. 1, 1878, = 10 mo.

Amt. of \$540, 10 mo. @ 8% = \$576.00

Amt. of \$90, 8 mo. = \$94.80

Amt. of \$100, 6 mo. = 104.00

Amt. of \$150, 5 mo. = 155.00

Amt. of \$180, 2 mo. 20 da. = 183.20 537.00

Balance due, \$39.00, *Ans.***DISCOUNT.****CASE I.****Art. 196.**1st. *When the note does not bear interest.*

(2.) Days in June, 10 Int. of \$1 for 63 da. @

Days in July, 31 6% = \$0.0105.

Days in Aug., 19 \$100 \times .0105 = \$1.05

60 \$100 — \$1.05 = \$98.95

To 19th Aug. add 3 da. grace.

Ans. Aug. $\frac{19}{22}$. \$1.05, \$98.95(3.) Remaining days in Oct., 19: 30 — 19 = Nov. $\frac{11}{14}$:int. on \$1 33, da. @ 8% = \$0.0073+: \$120 \times .0073+ =
\$0.88: \$120 — \$0.88 = \$119.12*Ans.* Nov. $\frac{11}{14}$, \$0.88, \$119.12

(4.) Int. of \$1, 4 mo. 3 da. @ 6% = \$0.0205: \$140 \times .0205 = \$2.87: \$140 - \$2.87 = \$137.13.

Ans. May $^{15}/_{18}$, \$2.87, \$137.13

(5.) Int. of \$180, 1 yr. @ 4% = \$7.20: int. of \$180, 6 mo. @ 4% = \$3.60: int. of \$180, 3 da. @ 4% = \$0.06: \$3.60 + \$0.06 = \$3.66: \$180 - \$3.66 = \$176.34

Ans. Oct. $^{10}/_{13}$, \$3.66, \$176.34

(6.) Int. of \$250, 1 yr. @ 8% = \$20.00: int. of \$250, 5 mo. 3 da. = \$8.50: \$250 - \$8.50 = \$241.50

Ans. May $^1/_4$, \$8.50, \$241.50

(7.) Days remaining in Aug., 27, + 3 = Sept. $^3/_6$: 6% on \$1 for 33 da. = \$0.0055: \$375 \times .0055 = \$2.06: \$375 - \$2.06 = \$372.94

Ans. Sept. $^3/_6$, \$2.06, \$372.94

(8.) Int. on \$600 for 2 mo. 3 da. = \$9.45: \$600 - \$9.45 = \$590.55

Ans. Apr. $^{12}/_{15}$, \$9.45, \$590.55

(9.) Remaining days in Feb., 8, March, 31, April, 30 = 69 da.: 90 - 69 = May $^{21}/_{24}$. Int. on \$1200, 1 mo. @ 10% = \$10: for $3\frac{1}{10}$ mo. = \$31: \$1200 - \$31 = \$1169.

Ans. May $^{21}/_{24}$, \$31, \$1169.

(10.) Int. on \$1, 93 da. @ 6% = \$0.0155: \$1780 \times .0155 = \$27.59: days remaining in Jan., 20, + 29 (Feb., leap yr.) + 31 (Mar.) = 80: 90 - 80 = Apr. $^{10}/_{13}$. \$1780

- \$27.59 = \$1752.41

Ans. Apr. $^{10}/_{13}$, \$27.59, \$1752.41

(11.) Due Sept. $\frac{15}{18}$, 1877: number of days from May 21 to Sept. 18 = May, 10, June, 30, July, 31, Aug., 31, Sept., 18 = 120: int. on \$600 for 120 da. (4 mo.) at 10% = \$20: \$600 — \$20 = \$580.

Ans. Sept. $\frac{15}{18}$, 1877, 120 da., \$20, \$580.

(12.) In May, 23 da., June, 30, July, 31 = 84: 90 — 84 = $\frac{6}{9}$ Aug.: June 8 to Aug. 9 = 48 da. = $1\frac{2}{3}$ mo.: int. on \$1000, $1\frac{2}{3}$ mo. @ 6% = \$8: \$1000 — \$8 = \$992.

Ans. Aug. $\frac{6}{9}$, 48 da., \$8, \$992.

(13.) 6 mo. after July 10, 1877, = Jan. $\frac{10}{13}$, 1878: days in Oct., 7*, Nov., 30, Dec., 31, Jan., 13 = 81: 81 da. = 2 mo. 21 da.: int. on \$1500 for this time @ 6% = \$20.25: \$1500 — \$20.25 = \$1479.75

Ans. Jan. $\frac{10}{13}$, 1878, 81 da., \$20.25, \$1479.75

2D. *When the note bears interest.*

(2.) 6 mo. from May 20, 1875, = Nov. $\frac{20}{23}$: amt. of \$150 @ 6% int. 6, mo. 3 da. = \$154.58: Sept. 9 to Nov. 23 = 75 da. or $2\frac{1}{2}$ mo.: discount on \$154.58, $2\frac{1}{2}$ mo. @ 8% = \$2.58: \$154.58 — \$2.58 = \$152.

Ans. Nov. $\frac{20}{23}$, 1875, 75 da., \$2.58, \$152.

* See Rem. 3, page 249, Ray's New Practical Arithmetic.

(3.) 1 yr. from Aug. 5, 1876, = Aug. $\frac{5}{8}$, 1877: amt. of \$300, 1 yr. 3 da. @ 8% int. = \$324.20: Apr. 16 to Aug. 8 = 114 da. or $3\frac{4}{5}$ mo.: discount on \$324.20, $3\frac{4}{5}$ mo. at 6% = \$6.16: \$324.20 — \$6.16 = \$318.04 = proceeds.

Ans. Aug. $\frac{5}{8}$, 1877, 114 da., \$6.16, \$318.04

(4.)

1878	1	4
1877	3	4
<hr/>		
	10	mo.

 \$450, 10 mo. @ 6% amounts to \$472.50: Aug. 13, 1877, to Jan. 4, 1878, = 144 da. or $4\frac{4}{5}$ mo.: discount on \$472.50, $4\frac{4}{5}$ mo. @ 10% = \$18.90: \$472.50 — \$18.90 = \$453.60

Ans. Jan. $\frac{1}{4}$, 1878, 144 da., \$18.90, \$453.60

(5.)

1878	9	4
1876	5	16
<hr/>		
2	3	18

 \$650, 2 yr. 3 mo. 18 da. @ 9% = \$784.55: Apr. 25, 1878, to Sept. 4, 1878, = 132 da. or $4\frac{2}{5}$ mo.: discount @ 6% on \$784.55 for $4\frac{2}{5}$ mo. = \$17.26: \$784.55 — \$17.26 = \$767.29 = proceeds.

Ans. Sept. $\frac{1}{4}$, 1878, 132 da., \$17.26, \$767.29

(6.) Amt. of \$840, 6 mo. 3 da. @ 10% = \$882.70: Dec. 20, 1875, to Mar. 4, 1876 = 75 da. or $2\frac{1}{2}$ mo.: discount on \$882.70, $2\frac{1}{2}$ mo. @ 8% = \$14.71: \$882.70 — \$14.71 = \$867.99 = proceeds.

Ans. Mar. $\frac{1}{4}$, 1876, 75 da., \$14.71, \$867.99

(7.) 1876 5 4 Amt. of \$1400, $9\frac{1}{2}$ mo. @
 1875 7 19 $6\% = \$1466.50$: Jan. 17,
 9 mo. 15 da. 1876, to May 4, 1876, = 108
 da. or $3\frac{2}{3}$ mo.: discount on
 $\$1466.50$, $3\frac{2}{3}$ mo. @ $10\% = \$44.00$: $\$1466.50 - \$44.00 =$
 $\$1422.50 =$ proceeds.

Ans. May $\frac{1}{4}$, 1876, 108 da., \$44, \$1422.50

(8.) 1878 1 4 Amt. of \$2400, 1 yr. 2 mo.
 1876 10 16 18 da. @ $8\% = \$2633.60$:
 1 yr. 2 mo. 18 da. July 26, 1877, to Jan. 4,
 1878 = 162 da. or $5\frac{2}{3}$ mo.:
 discount on $\$2633.60$, $5\frac{2}{3}$ mo. @ $10\% = \$118.51$: $\$2633.60$
 $- \$118.51 = \$2515.09 =$ proceeds.

Ans. Jan. $\frac{1}{4}$, 1878, 162 da., \$118.51, \$2515.09

(9.) Amt. of \$3500 @ 6% , 1 yr. 3 da. = \$3711.75:
 May 15 to Oct. 18, 1878, = 156 da. or $5\frac{1}{3}$ mo.: discount
 on \$3711.75, $5\frac{1}{3}$ mo. @ $9\% = \$144.76$: $\$3711.75 - \144.76
 $= \$3566.99 =$ proceeds.

Ans. Oct. $\frac{15}{18}$, 1878, 156 da., \$144.76, \$3566.99

(10.) Amt. of \$6000, 1 yr. 3 da. @ $8\% = \$6484.00$: Nov.
 21, 1875, to May 13, 1876, = 174 da. or $5\frac{4}{5}$ mo.: discount
 on \$6484, $5\frac{4}{5}$ mo. @ $10\% = \$313.39$: $\$6484.00 - \313.39
 $= \$6170.61 =$ proceeds.

Ans. May $\frac{10}{13}$, 1876, 174 da., \$313.39, \$6170.61

Art. 197.

(2.) Bank discount on \$1, 63 da. @ $6\% = \$0.0105$:
 $\$1 - \$0.0105 = \$0.9895$: $\$197.90 \div .9895 = \200 , *Ans.*

(3.) Discount on \$1, 93 da. @ $6\% = \$0.0155$: $\$1 -$
 $\$0.0155 = \0.9845 : $\$393.80 \div .9845 = \400 , *Ans.*

(4.) Discount on \$1, 5 mo. 3 da. @ 8% = \$0.034: \$1 — \$0.034 = \$0.966: \$217.35 ÷ .966 = \$225, *Ans.*

(5.) Discount on \$1, 4 mo. 3 da. @ 6% = \$0.0205: \$1 — \$0.0205 = \$0.9795: \$352.62 ÷ .9795 = \$360, *Ans.*

(6.) Discount on \$1, 33 da. @ 6% = \$0.0055: \$1 — \$0.0055 = \$0.9945: \$400 ÷ .9945 = \$402.21+, *Ans.*

(7.) Discount on \$1, 2 mo. 3 da. @ 8% = \$0.014: \$1 — \$0.014 = \$0.986: \$500 ÷ .986 = \$507.10 (nearly), *Ans.*

(8.) Discount on \$1, 6 mo. 3 da. @ 10% = \$0.050833+: \$1 — \$0.050833 = \$0.949166: \$1500 ÷ .949166 = \$1580.33+, *Ans.*

(9.) Oct. 12, 1876, to Jan. 4, 1877, = 2 mo. 24 da., or $2\frac{2}{3}$ mo.: discount on \$1, $2\frac{2}{3}$ mo. @ 6% = \$0.014: \$1 — \$0.014 = \$0.986: \$1055.02 ÷ .986 = \$1070.

1877	1	4	\$1 @ 8% for 10 mo. 15 da. =
1876	2	19	\$0.07: \$1 + \$0.07 = \$1.07: \$1070
<hr/>			
10 mo. 15 da.			÷ 1.07 = \$1000, <i>Ans.</i>

Art. 199.

(3.) Amt. of \$1, 2 yr. @ 6% = \$1.12: \$224 ÷ 1.12 = \$200 = present worth: \$224 — \$200 = \$24 = discount.

(4.) Amt. of \$300 for 2 yr. @ 8% = \$348: amt. of \$1 for 2 yr. @ 6% = \$1.12: \$348 ÷ 1.12 = \$310.71 = present worth: \$348 — \$310.71 = \$37.29 = discount.

(5.) Amt. of \$1, 5 yr. 10 mo. @ 6% = \$1.35: \$675 ÷ 1.35 = \$500 = present worth: \$675 — \$500 = \$175 = discount.

(6.) Amt. of \$1, 5 mo. @ 10% = \$1.04166+: \$368.75 ÷ 1.04166 = \$354 = present worth: \$368.75 — \$354 = \$14.75 = discount.

(7.) 1878	1	1	Amt. of \$800, 1 yr. 3 mo.
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$$1876 \quad 9 \quad 10 \quad 21 \text{ da. @ } 6\% = \$862.80:$$

1	3	21	July 19, 1877, to Jan. 1, 1878 = 5 mo. 12 da.: amt.
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of \$1, 5 mo. 12 da. @ 10% = \$1.045: $\$862.80 \div 1.045 =$
 $\$825.65 =$ present worth: $\$862.80 - \$825.65 = \$37.15 =$
discount.

(8.) Amt. of \$1, 4 mo. @ 10% = $1.03\frac{1}{3}$: $\$775 \div 1.03\frac{1}{3}$
= \$750, Ans.

(9.) Amt. of \$1, 8 mo. @ $6\% = \$1.04$: $\$260 \div 1.04 = \250 , *Ans.*

(10.) \$2480 — its 5% (\$124) = \$2356 = cash cost. Amt. of \$1, 4 mo. @ 10% = \$1.03 $\frac{1}{3}$; \$2480 \div 1.03 $\frac{1}{3}$ = \$2400 present worth. \$2400 — \$2356 = \$44, *Ans.*

(11.) $\frac{1}{3}$ of \$956.34 = \$318.78

$$\text{Amt. of \$1, 1 yr. @ 5\%} = \$1.05: \$318.78 \div 1.05 = \$303.60$$
$$\text{Amt. of \$1, 2 yr. @ 5\%} = \$1.10: \$318.78 \div 1.10 = 289.80$$
$$\text{Amt. of \$1, 3 yr. @ 5\%} = \$1.15: \$318.78 \div 1.15 = 277.20$$

Ans. \$870.60

(12.) $\$535 \times .07 = \$37.45 = \text{bank discount: } \$535 \div 1.07$
 $= \$500: \$535 - \$500 = \$35: \$37.45 - \$35 = \$2.45, \text{ Ans.}$

(13.) $\$750 - (\$750 \times .04) = \$720$, cash cost. Amt. of \$1 for 3 mo. @ 8% = \$1.02: $\$750 \div \$1.02 = \$735.29$, present worth: $\$735.29 - \$720 = \$15.29$, *Ans.*

(14.) $\frac{1}{3}$ of \$10296 = \$3432. Amt. of \$1, 1 yr. @ 10% = \$1.10: amt. of \$1, 2 yr. @ 10% = \$1.20: amt. of \$1, 3 yr. @ 10% = \$1.30.

$$\$3432 \div 1.10 = \$3120$$
$$\$3432 \div 1.20 = 2860$$
$$\$3432 \div 1.30 = 2640 \quad \$8620$$
$$\cdot \quad \$8620 - \$8000 = \$620, \text{ Ans.}$$

(15.) July 4, 1876, to May 1, 1878, = 1 yr. 9 mo. 27 da.
 Amt. of \$2000, 1 yr. 9 mo. 27 da. @ 8% = \$2292: Oct.
 25, 1877, to May 1, 1878, = 6 mo. 6 da.: Amt. of \$1, 6 mo.
 6 da. @ 6% = \$1.031: $\$2292 \div 1.031 = \2223.08 = present
 worth: $\$2292 - \$2223.08 = \$68.92$ = discount.

EXCHANGE.

Art. 201.

(1.) 1% of \$1400 = \$14: $\frac{1}{2}\% = \$\frac{14}{2} = \7 : $\$1400 + \$7 = \$1407$, *Ans.*

(2.) $\frac{1}{2}\%$ of \$2580 = \$12.90: $\$2580 - \$12.90 = \$2567.10$,
Ans.

(3.) $\$375.87 = 100\% + \frac{1}{8}\%$ of the face: $\$375.87 \div 100\frac{1}{8} = \375.40 , *Ans.*

(4.) $\frac{1}{4}\%$ of \$2785 = \$6.96: $\$2785 - \$6.96 = \$2778.04$,
Ans.

(5.) $100\% - 1\frac{1}{4} = 98\frac{3}{4}\% = .9875$: $\$1852.55 \div .9875 = \1876 , *Ans.*

(6.) Int. of \$5680. for 63 da. @ 6% = \$59.64; $\frac{1}{2}\%$ prem.
 on \$5680. = \$28.40; $\$59.64 - \$28.40 = \$31.24$; $\$5680. - \$31.24 = \$5648.76$, *Ans.*

(7.) Int. of \$1575. for 33 da. @ 6% = \$8.66; $\frac{3}{4}\%$ prem.
 on \$1575. = \$11.81; $\$11.81 - \$8.66 = \$3.15$; $\$1575. + \$3.15 = \$1578.15$, *Ans.*

(8.) Int. of \$2625. for 63 da. @ 6% = \$27.56; $1\frac{1}{2}\%$
 prem. on \$2625. = \$39.37; $\$39.37 - \$27.56 = \$11.81$;
 $\$2625. + 11.81 = \2636.81 , *Ans.*

Art. 202.

$$(3.) 8s. = \frac{4}{10}£: £890.4 \times 4.86 (\$) = \$4327.34, \text{ Ans.}$$

$$(4.) \$2130.12 \div 4.88 = 436, \text{ with } 244 \text{ rem.: } 244 \times 20s., \div 4.88 = 10. \text{ Ans. } £436 \text{ } 10s.$$

$$(5.) 5 \text{ fr. } 15 \text{ centimes} = \$5\frac{3}{20} \text{ fr.: } 1290 \div 5\frac{3}{20} = \$250.49, \text{ Ans.}$$

$$(6.) \$1657.60 \times 5\frac{16}{100} = 8553 \text{ fr. } 22, \text{ Ans.}$$

$$(7.) \$12680 \div 4 = 3170, \times .97 = \$3074.90, \text{ Ans.}$$

$$(8.) \text{ If } 4 \text{ marks} = \$0.98, 1 \text{ m.} = \$0.245: \$1470 \div .245 = 6000 \text{ m., Ans.}$$

INSURANCE.**Art. 204.**

$$(2.) \frac{3}{4} \text{ of } \$5000 = \$3750: \frac{1}{2}\% \text{ of } \$3750 = \$18.75, \text{ add } \$1.50 = \$20.25, \text{ Ans.}$$

$$(3.) \frac{2}{3} \text{ of } \$12600 = \$8400, @ \frac{3}{4}\% = \$63.00$$

$$\frac{1}{2} \text{ of } \$14400 = \$7200, @ 2\% = 144.00$$

$$2 \text{ policies } @ \$1.25 = \underline{2.50}$$

$$\text{Ans. } \$209.50$$

$$(4.) \frac{4}{7} \text{ of } \$21000 = \$12000, @ 1\frac{1}{2}\% = \$180.00$$

$$\$7200 @ \frac{3}{4}\% = 54.00$$

$$2 \text{ policies } @ \$1.25 = \underline{2.50}$$

$$\text{Ans. } \$236.50$$

$$(5.) \frac{3}{4} \text{ of } \$5600 = \$4200, \times .01\frac{1}{2} = \$63, \times 20 \text{ (yr.)} = \$1260: \$4200 - \$1260 = \$2940, \text{ Ans.}$$

$$(6.) \$3600 + \$1600 + \$800 = \$6000: \frac{7}{8}\% \text{ of } \$6000 = \$52.50, + \$1.25 = \$53.75, \text{ Ans.}$$

(7.) $\$151.25 - \$1.25 = \$150$: $\$150 = 1\frac{1}{2}\%$ of $\frac{2}{3}$ value:
 $\$100 = 1\%$ of $\frac{2}{3}$ value: $\$10000 = 100\%$ of $\frac{2}{3}$ value: $\frac{2}{3}$, or
 the whole value, $= \$15000$, *Ans.*

(8.) $\frac{4}{5}$ of $\$4500 = \3600 : $\$32.75 - \$1.25 = \$31.50$:
 $\$31.50 \div 3600 = .0087\frac{1}{2} = \frac{7}{8}\%$, *Ans.*

(9.) $\$1000 + \$1500 = \$2500$: $\$3.50 \div 2500 = .0014 =$
 $\frac{7}{50}\%$, *Ans.*

Art. 205.

(2.) $\$105.53 \times 10 = \$1055.30 =$ amount paid yearly:
 $\$1055.30 \times 10 = \10553 , *Ans.*

(3.) $\$47.18 \times 8 \times 20 = \7548.80 : $\$60.45 \times 8 \times 20 =$
 $\$9672.00$: $\$9672 - \$7548.80 = \$2123.20$, *Ans.*

(4.) $\$36.46 \times 12 \times 5 = \2187.60 : $\$12000 - \2187.60
 $= \$9812.40$, *Ans.*

(5.) 75 yr. $-$ 21 yr. $=$ 54 yr.: $\$19.89 \times 5 \times 54 =$
 $\$5370.30$, *Ans.*

(6.) $\$104.58 \times 10$ (yr.) $= \$1045.80$ There will be int.
 @ 6% on $\$104.58$, $10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2$
 $+ 1$, or 55, yr. $= \$345.11$: $\$1045.80 + \$345.11 = \$1390.91$,
Ans.

(7.) $\$29.15 \times 6 = \174.90 , $\times 15 = \$2623.50$: int. @
 6% on $\$174.90$ for $15 + 14 + 13 + 12 + 11 + 10 + 9 + 8$
 $+ 7 + 6 + 5 + 4 + 3 + 2 + 1$, or 120, yr. $= \$1259.28$, $+$
 $\$2623.50 = \3882.78 , *Ans.*

TAXES.

Art. 208.

(2.) $\$2500 - \$28 = \$2472$: $2472 \div 618000 = .004$
Ans. 4 mills on $\$1$, or $\frac{2}{5}\%$.

(3.) $18409.44 \div 2876475 = .0064 = 6.4$ mills $=$ *Ans.*

(4.) $656491.61 \div 421285359 = .00156 = 1.56$ mills $=$
Ans.

Art. 209.

[I.] $\$1.25 \times 57 = \71.25 ; $\$1373.64 - \$71.25 = \$1302.39$;
 $1302.39 \div 748500 = .00174 = \text{rate } 1.74 \text{ mills on } \$1.$

(2.) $\$2576 \times .00174 = \4.48 , + $\$1.25$ (poll-tax) =
 $\$5.73$, *Ans.*

(3.) $\$9265 \times .00174 = \16.12 , + $\$3.75$ (3 poll-taxes) =
 $\$19.87$, *Ans.*

(4.) $\$4759 \times .00174 = \8.28 , + $\$1.25 = \9.53 , *Ans.*

(5.) $\$8367 \times .00174 = \14.56 , *Ans.*

[II.] $64375 \div 16869758 = .003816$. Rate 3.816 mills
on $\$1.$

TAX TABLE.—Rate, 3.816 mills on $\$1.$

PROP.	TAX.	PROP.	TAX.	PROP.	TAX.	PROP.	TAX.
\$1	\$0.004	\$10	\$0.038	\$100	\$0.382	\$1000	\$3.816
2	.008	20	.076	200	.763	2000	7.632
3	.011	30	.114	300	1.145	3000	11.448
4	.015	40	.153	400	1.526	4000	15.264
5	.019	50	.191	500	1.908	5000	19.080
6	.023	60	.229	600	2.290	6000	22.896
7	.027	70	.267	700	2.671	7000	26.712
8	.030	80	.305	800	3.053	8000	30.528
9	.034	90	.343	900	3.434	9000	34.344

(1.) $\$56875 \times .003816 = \217.04 , *Ans.*

(2.) $\$27543 \times .003816 = \105.10 , *Ans.*

$$(3.) \$83612 \times .003816 = \$319.06, \text{ Ans.}$$

$$(4.) \$72968 \times .003816 = \$278.45, \text{ Ans.}$$

$$(5.) \$69547 \times .003816 = \$265.39, \text{ Ans.}$$

Art. 211.

(1.) 36 sq. mi. contain 23040 A.: 23040 A. @ \$1.25 per acre = \$28800, *Ans.*

(2.) The charge will be the same as for 3 half-ounces. 3 times 3 ct. = 9 ct., *Ans.*

(3.) 1 lb. 5 oz. = 21 oz.: postage same as for 22 oz.: $22 \div 2 = 11$: 11 times 1 ct. = 11 ct., *Ans.*

$$(4.) 70 \text{ ct. times } 40 = \$28, \text{ Ans.}$$

$$(5.) \$5 = 500 \text{ ct.}: \frac{500}{1000} \text{ ct.} = \frac{1}{2} \text{ ct.}, \text{ Ans.}$$

(6.) 30000 bl. @ \$1	= \$30000
250 ret. dlrs. @ \$20 ea.	= 5000
12 wholesale dlrs. @ \$50 =	<u>600</u>
	\$35600, <i>Ans.</i>

Art. 212.

(1.) $12\frac{1}{2}\% = \frac{1}{8}$: 1760 lb. — its $\frac{1}{8} = 1540$ lb.: 1540 times $\$0.01\frac{3}{4} = \26.95 , *Ans.*

(2.) 40 bales of 400 lb. each = 16000 lb.: 5% tare = 800 lb.: 16000 — 800 = 15200: 15200 lb. @ 45 ct. = \$6840: 10% ad. val. = \$684: 15200 lb. @ 9 ct. duty = \$1368: \$684 + \$1368 = \$2052, *Ans.*

(3.) 365.15 fr. + 57.15 fr. = 422.30 fr., to which add 5% com. (21.1150 fr.) = 443.4150 fr.: $443.4150 \times 19\frac{3}{10}$ (ct.) = \$85.58: 40% of \$86 = \$34.40, *Ans.*

(4.) 1317.04 mk. + 34.36 mk. = 1351.40 mk.: add 6% com. (81.084 mk.) = 1432.484 mk.: 1432.484×23.8 (ct.) = \$340.93: 25% of \$341 = \$85.25, *Ans.*

(5.) 50 ct. per lb. duty on 1500 lb. = \$750: £8 4s. 6d. = £8 $\frac{9}{40}$ or £8.225: £500 + £8.225 = £508.225: add 2 $\frac{1}{2}$ % com. (£12.705+) = £520.93: £520.93 \times 4.8665 (\$) = \$2535.11: 35% of \$2535 = \$887.25: \$887.25 + \$750 = \$1637.25, *Ans.*

RATIO.

Art. 214.

$$(20.) \frac{7}{2} \times \frac{4}{9} = \frac{14}{9} = 1\frac{5}{9}, \text{ Ans.}$$

$$(21.) \frac{3\frac{5}{6}}{6} \times \frac{3}{7} = \frac{5}{2} = 2\frac{1}{2}, \text{ Ans.}$$

$$(22.) \frac{6\frac{9}{10}}{10} \times \frac{5}{3} = \frac{3}{2} = 1\frac{1}{2}, \text{ Ans.}$$

$$(28.) 5 \text{ yd. } 1 \text{ ft.} = 192 \text{ in.}: 5 \text{ ft. } 4 \text{ in.} = 64 \text{ in.}: \frac{192}{64} = 3, \text{ Ans.}$$

Art. 215.

$$(8.) 4 \text{ lb. } 8 \text{ oz.} = 72 \text{ oz.}: \frac{7}{8} \text{ of } 72 \text{ oz.} = 63 \text{ oz.}: 63 \text{ oz.} = 3 \text{ lb. } 15 \text{ oz.}, \text{ Ans.}$$

$$(9.) \$4.00 \times 2.6 = \$10.40, \text{ Ans.}$$

Art. 216.

$$(3.) 42 \times \frac{10}{7} = 60, \text{ Ans.}$$

$$(4.) 23\frac{3}{8} = \frac{187}{8}: \frac{187}{8} \times \frac{4}{11} = \frac{17}{2} = 8\frac{1}{2}, \text{ Ans.}$$

$$(5.) 7\frac{5}{9} = \frac{68}{9}: \$27.20 \times \frac{9}{68} = \$0.40 \times 9 = \$3.60, \text{ Ans.}$$

Art. 217.

$$(2.) \left. \begin{array}{l} 5 \times 6 = 30 \\ 10 \times 9 = 90 \end{array} \right\} 90 \div 30 = 3, \text{ Ans.}$$

$$(3.) \begin{array}{r|l} 2 & \\ 6\frac{1}{4} & 12\frac{1}{2} \\ 8\frac{1}{8} & 33\frac{1}{8} \\ & 4 \end{array} 4 \times 2 = 8, \text{ Ans.}$$

Key 13.

$$(4.) \frac{1}{2} \times \frac{5}{4} = \frac{5}{8} : \frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2} : \frac{\frac{1}{2}}{\frac{5}{8}} = \frac{8}{10} = \frac{4}{5}, \text{ Ans.}$$

$$(5.) 2 \times 24 = 48 : 8 \times 12 = 96 : 96 \div 48 = 2, \text{ Ans.}$$

$$(6.) \begin{array}{r|l} \$2.25 & \$6.75 \quad 3 \\ 3 & 6 \quad 2 \end{array} \quad 3 \times 2 = 6, \text{ Ans.}$$

$$(7.) \begin{array}{r|l} 2 & 5 \\ 3 & 7 \\ 5 & 9 \\ & 3 \end{array} \quad \frac{7 \times 3}{2} = \frac{21}{2} = 10\frac{1}{2}, \text{ Ans.}$$

Art. 219.

(2.) Divide by 5.

(5.) Divide by 19.

(3.) Divide by 10.

(6.) Divide by 25.

(4.) Divide by 17.

(7.) Divide by 31.

Art. 220.

$$(2.) \begin{array}{r} 3\frac{3}{4} : 4\frac{2}{5} \\ \hline 20 \end{array}$$

75 : 88, *Ans.*

$$(3.) \begin{array}{r} 7\frac{1}{2} : 10\frac{2}{3} \\ \hline 6 \end{array}$$

45 : 64, *Ans.*

$$(4.) \frac{5}{6} = \frac{15}{18} : \frac{7}{9} = \frac{14}{18}. \quad 15 : 14, \text{ Ans.}$$

$$(5.) \frac{63}{10} = \frac{189}{30} : \frac{97}{15} = \frac{142}{15} = \frac{284}{30}. \quad 189 : 284, \text{ Ans.}$$

PROPORTION.**Art. 223.**

$$(3.) 4$$

$$\frac{8 \times 6}{2} = 24, \text{ Ans.}$$

$$(4.) \quad 2$$

$$\frac{7 \times 10}{5} = 14, \text{ Ans.}$$

$$(5.) \quad 3$$

$$\frac{8 \times 6}{2} = 3, \text{ Ans.}$$

$$(6.) \quad 2$$

$$\frac{5 \times 12}{6} = 10, \text{ Ans.}$$

$$(7.) \quad \begin{array}{c} 2 \\ 3 \times 14 \\ 7 \end{array} = 6, \text{ Ans.}$$

$$(8.) \quad \begin{array}{c} 2 \\ 14 \times 9 \\ 7 \end{array} = 18, \text{ Ans.}$$

$$(9.) \quad \begin{array}{c} 2 \quad 5 \\ 2 \times 8 \times 45 \\ 4 \times 9 \end{array} = 20, \text{ Ans.}$$

$$(10.) \quad \begin{array}{c} 2 \quad 2 \\ 8 \times 10 \times 3 \times 7 \\ 5 \times 4 \times 4 \\ 2 \end{array} = 21, \text{ Ans.}$$

$$(11.) \quad \begin{array}{c} 5 \quad 2 \quad 3 \quad 3 \\ 10 \times 14 \times 33 \times 39 \\ 21 \times 22 \times 26 \\ 3 \quad 2 \quad 2 \end{array} = 15, \text{ Ans.}$$

$$(12.) \quad \frac{3}{4} \times \frac{4}{5} = \frac{3}{5} : \frac{3}{5} \times \frac{3}{2} = \frac{9}{10}, \text{ Ans.}$$

$$(13.) \quad \begin{array}{c} 5 \\ \frac{3}{5} \times \frac{5}{4} = \frac{3}{4} : \frac{3}{4} \times \frac{10}{9} = \frac{5}{6}, \text{ Ans.} \\ 2 \quad 3 \end{array}$$

$$(14.) \quad \begin{array}{c} 7 \quad 5 \quad 5 \\ \frac{14}{3} \times \frac{15}{2} = 35 : \frac{35}{1} \times \frac{2}{21} = \frac{10}{3} = 3\frac{1}{3}, \text{ Ans.} \\ 3 \end{array}$$

$$(15.) \quad \frac{6 \times 6}{4} = 9, \text{ Ans.}$$

Art. 224.

$$(3.) \quad 6 : 12 :: 3 : ? \quad \begin{array}{c} 2 \\ 12 \times 3 \\ 6 \end{array} = 6, \text{ Ans.}$$

$$(4.) \quad 3 : 6 :: \$8 : ? \quad \begin{array}{c} 2 \\ 6 \times 8 \\ 3 \end{array} = \$16, \text{ Ans.}$$

$$(5.) \quad 5 : 3 :: \$30 : ? \quad \frac{3 \times \overset{6}{\cancel{30}}}{\underset{5}{\cancel{5}}} = \$18, \text{ Ans.}$$

$$(6.) \quad 3 \text{ lb. } 12 \text{ oz.} = 60 \text{ oz.} : 11 \text{ lb. } 4 \text{ oz.} = 180 \text{ oz.}$$

$$60 : 180 :: \$3.50 : ? \quad \frac{\overset{3}{180} \times 3.50}{\cancel{60}} = \$10.50, \text{ Ans.}$$

$$(7.) \quad 2 \text{ lb. } 8 \text{ oz.} = 40 \text{ oz.} \quad \$2 : \$5 :: 40 \text{ oz.} : ?$$

$$\frac{\overset{20}{5} \times \cancel{40}}{\underset{2}{\cancel{2}}} = 100 \text{ oz.} = 6 \text{ lb. } 4 \text{ oz., Ans.}$$

$$(8.) \quad 4 : 10 :: \$14 : ? \quad \frac{\overset{5}{10} \times \overset{7}{\cancel{14}}}{\underset{2}{\cancel{4}}} = \$35, \text{ Ans.}$$

$$(9.) \quad 3 : 11 :: 69 \text{ ct.} : ? \quad \frac{\overset{23}{11} \times \cancel{69}}{\underset{3}{\cancel{3}}} = \$2.53, \text{ Ans.}$$

$$(10.) \quad 4 : 9 :: \$7 : ? \quad \frac{\overset{9}{4} \times \cancel{7}}{\underset{4}{\cancel{4}}} = \$15.75, \text{ Ans.}$$

$$(11.) \quad 8 : 12 :: \$32 : ? \quad \frac{\overset{4}{12} \times \cancel{32}}{\underset{8}{\cancel{8}}} = \$48, \text{ Ans.}$$

$$(12.) \quad 12 : 8 :: \$48 : ? \quad \frac{\overset{4}{48} \times \cancel{8}}{\underset{12}{\cancel{12}}} = \$32, \text{ Ans.}$$

$$(13.) \quad \$32 : \$48 :: 8 : ? \quad \frac{\overset{12}{48} \times \cancel{8}}{\underset{4}{\cancel{32}}} = 12 \text{ yd., Ans.}$$

$$(14.) \quad \$48 : \$32 :: 12 : ? \quad \frac{\overset{8}{\cancel{32}} \times \cancel{12}}{\underset{4}{\cancel{48}}} = 8 \text{ yd., Ans.}$$

$$(15.) \quad 19 : 4 :: \$152 : ? \quad \frac{4 \times \overset{8}{\cancel{152}}}{\cancel{19}} = \$32, \text{ Ans.}$$

$$(16.) \quad 12 : 8 :: 24 : ? \quad \frac{\overset{2}{8} \times \cancel{24}}{\cancel{12}} = 16 \text{ da., Ans.}$$

$$(17.) \quad 2 : 8 :: 60 : ? \quad \frac{\overset{4}{8} \times 60}{\cancel{2}} = 240 \text{ men, Ans.}$$

$$(18.) \quad 6 \text{ lb.} = 96 \text{ oz.} \quad 15 : 96 :: 25 \text{ ct.} : ?$$

$$\frac{\overset{32}{96} \times \overset{5}{\cancel{25}}}{\underset{\cancel{3}}{\cancel{15}}} = \$1.60, \text{ Ans.}$$

$$(19.) \quad 6 : 26 :: \$2.70 : ? \quad \frac{\overset{.45}{26} \times \cancel{2.70}}{\cancel{6}} = \$11.70, \text{ Ans.}$$

$$(20.) \quad 585 \text{ lb.} : 3525 \text{ lb.} :: \$42.12 : ?$$

$$\frac{\overset{705}{\cancel{3525}} \times \overset{.36}{\cancel{42.12}}}{\underset{\cancel{117}}{\cancel{585}}} = \$253.80, \text{ Ans.}$$

$$(21.) \quad \frac{3}{2} : \frac{9}{8} :: \$2.50 : ? \quad \frac{\overset{3}{9} \times 2.50}{\underset{\cancel{8}}{\cancel{6}}} \times \frac{\cancel{2}}{\cancel{3}} = \$1.87\frac{1}{2}, \text{ Ans.}$$

$$(22.) \quad 90 : 450 :: 6 : ? \quad \frac{\overset{30}{\cancel{450}} \times \underset{\underset{6}{\cancel{6}}}{6}}{\underset{\underset{6}{\cancel{6}}}{90}} = 30 \text{ da., Ans.}$$

$$(23.) \quad 5 : 15 :: 6 : ? \quad \frac{\overset{3}{\cancel{15}} \times 6}{\underset{\underset{5}{\cancel{5}}}{5}} = 18 \text{ men, Ans.}$$

$$(24.) \quad 30 : 140 :: 15 : ? \quad \frac{\overset{70}{\cancel{140}} \times \underset{\underset{2}{\cancel{2}}}{15}}{\underset{\underset{2}{\cancel{2}}}{30}} = 70 \text{ bu., Ans.}$$

$$(25.) \quad 325 \text{ lb.} : 1625 \text{ lb.} :: \$22.60 : ?$$

$$\frac{\overset{5}{\cancel{1625}} \times 22.60}{\underset{\underset{13}{\cancel{13}}}{325}} = \$113.00, \text{ Ans.}$$

$$(26.) \quad 4\frac{1}{2} \text{ ft.} : 180 \text{ ft.} :: 3 \text{ ft.} : ?$$

$$180 \times 3 = 540; \quad \frac{\overset{60}{\cancel{540}}}{1} \times \frac{2}{9} = 120 \text{ ft., Ans.}$$

$$(27.) \quad 12 : 9 :: 60 : ? \quad \frac{9 \times \overset{5}{\cancel{60}}}{\underset{\underset{12}{\cancel{12}}}{12}} = 45 \text{ da., Ans.}$$

$$(28.) \quad \left. \begin{array}{l} 100 : 60 :: 2200 : ? \quad \frac{2200 \times \overset{60}{\cancel{100}}}{\underset{\underset{100}{\cancel{100}}}{100}} = \$1320, \text{ A's.} \\ 100 : 60 :: 1800 : ? \quad \frac{1800 \times \overset{60}{\cancel{100}}}{\underset{\underset{100}{\cancel{100}}}{100}} = \$1080, \text{ B's.} \end{array} \right\} \text{ Ans.}$$

$$(29.) \quad \$800.30 + \$250 + \$375.10 + \$500 + \$115 =$$

$$\$2040.40. \quad \$2040.40 : \$612.12 :: \$1.00 : ?$$

$$\$612.12 \div 2040.40 = \$0.30, \text{ Ans.}$$

$$(30.) \quad \$6 : \$8 :: 9 \text{ oz.} : ? \quad \begin{array}{r} 4 \quad 3 \\ 8 \times 9 \\ \hline 6 \\ 2 \end{array} = 12 \text{ oz., Ans.}$$

$$(31.) \quad \$300 : \$250 :: 6 \text{ mo.} : ? \quad \begin{array}{r} 5 \\ 250 \times 6 \\ \hline 300 \\ 6 \end{array} = 5 \text{ mo., Ans.}$$

$$(32.) \quad 27 \times 7 = 189; 36 - 27 = 9. \\ 9 \text{ mi.} : 189 \text{ mi.} :: 1 \text{ da.} : ? \quad \frac{189}{9} = 21 \text{ da., Ans.}$$

$$(33.) \quad 9 \text{ hr.} : 12 \text{ hr.} :: \$15\frac{2}{3} : ? = \$20.88\frac{8}{9}, \text{ or } 1 \text{ mo.'s} \\ \text{services when he works 12 hr. a day.} \\ \$20.88\frac{8}{9} \times 4\frac{2}{5} = \$91.91\frac{1}{9}, \text{ Ans.}$$

$$(34.) \quad \text{As } 5 \text{ lb.} : \frac{3}{4} \text{ lb.} :: \$\frac{5}{8} : \$\frac{3}{32}, \text{ Ans.}$$

$$(35.) \quad \text{As } 6 \text{ yd.} : 7\frac{3}{8} \text{ yd.} :: \$5\frac{3}{5} : \$6\frac{53}{60}, \text{ Ans.}$$

$$(36.) \quad \text{As } \frac{1}{3} \text{ bu.} : \frac{1}{2} \text{ bu.} :: \$\frac{3}{8} : \$\frac{9}{16}, \text{ Ans. } (\frac{1}{3} \times \frac{1}{2} \times \frac{3}{8} = \frac{9}{16}.)$$

$$(37.) \quad \text{As } 1\frac{3}{4} \text{ yd.} : 2 \text{ yd.} :: \$\frac{7}{24} : \$\frac{1}{3}, \text{ Ans. } (\frac{4}{7} \times \frac{2}{1} \times \frac{7}{24} = \frac{1}{3}.)$$

$$(38.) \quad \text{As } \$29\frac{3}{4} : \$31\frac{1}{4} : 59\frac{1}{2} \text{ yd.} : ? \quad \text{By cancellation,} \\ \frac{4}{119} \times \frac{125}{4} \times \frac{119}{2} = \frac{125}{2} = 62\frac{1}{2} \text{ yd., Ans.}$$

$$(39.) \quad \text{As } .85 \text{ gal.} : .25 \text{ gal.} :: \$1.36 : \$0.40, \text{ Ans.}$$

$$(40.) \quad \text{As } 61.3 \text{ lb.} : 1.08 \text{ lb.} :: \$44.9942 : \$0.79, \text{ Ans.}$$

$$(41.) \quad \text{As } \frac{5}{7} \text{ yd.} : \frac{9}{11} \text{ yd.} :: \$\frac{3}{5} : \$\frac{189}{275}, \text{ Ans.}$$

$$(42.) \quad \text{As } \frac{3}{7} \text{ yd.} : 17\frac{3}{8} \text{ yd.} :: \$4\frac{2}{5} : ? \\ \frac{7}{3} \times \frac{139}{8} \times \frac{22}{5} = \$178.38\frac{1}{3}, \text{ Ans.}$$

$$(43.) \quad \text{As } 26 \text{ cogs} : 35 \text{ cogs} :: 1 \text{ rev.} : 1\frac{9}{26} \text{ rev.} \quad \text{Hence,} \\ \text{the smaller wheel gains } \frac{9}{26} \text{ of a revolution in each revolution} \\ \text{of the larger wheel. Then, } \frac{9}{26} \text{ rev} : 10 \text{ rev.} :: 1 \\ \text{rev. of larger} : 28\frac{8}{9} \text{ revolutions of larger, Ans.}$$

(44.) 1 gal. = 32 gills; $32 - 1 = 31$. As 32 : 31 : : 100 gal. : $96\frac{2}{3}$ gal., *Ans.*

(45.) As 70 p. : 20 p. : : 60 sec. : $17\frac{1}{7}$ sec.
 $1142 \text{ ft.} \times 17\frac{1}{7} = 19577\frac{1}{7} \text{ ft.} = 3 \text{ mi. } 226 \text{ rd. } 2 \text{ yd. } 2\frac{1}{7} \text{ ft., } \textit{Ans.}$

(46.) As 25 ft. : 25 ft. 5.25 in. : : 643 ft. 8 in. : 654 ft. 11.17 in., *Ans.*

Art. 225.

(3.) $\left. \begin{array}{l} 2 \text{ da.} : 10 \text{ da.} \\ 4 \text{ hr.} : 8 \text{ hr.} \end{array} \right\} : : 24 \text{ mi.} : 240 \text{ mi., } \textit{Ans.}$

(4.) As 18 rd. : 72 rd. The more rods, the more men.
 And as 8 da. : 12 da. The less days, the more men.
 : : 16 men : 96 men, *Ans.*

[dollars.
 (5.) As 6 p. : 15 p. The more persons, the more
 [dollars.

8 mo. : 20 mo. The more months, the more
 : : \$150 : \$937.50, *Ans.*

(6.) As 7 da. : 9 da. The more days, the more miles.
 6 hr. : 11 hr. The more hours, the more mi.
 : : 217 mi. : $511\frac{1}{2}$ mi., *Ans.*

(7.) As \$100 : \$75. The less dollars, the less interest.
 12 mo. : 9 mo. The less months, the less interest.
 : : \$6 : \$3.375, *Ans.*

(8.) As 10100 lb. : 100 lb. The more lb., the less miles.
 20 ct. : \$60.60 The more money, the more
 : : 20 mi. : 60 mi., *Ans.* [miles.

(9.) As 12 cwt. 75 lb. : 10 T. The more weight, the
 more money.
 400 mi. : 75 mi. The less miles, the less
 money.
 : : \$57.12 : \$168, *Ans.*

(10.) As 20 men : 18 men. The more men, the less days.

40 rd. l. : 87 rd. l. The more length, the more days.

5 ft. h. : 8 ft. h. The more height, the more days.

4 ft. t. : 5 ft. t. The more thickness, the more days.

: : 15 days : $58\frac{2}{3}$ days, *Ans.*

(11.) As 100 men : 180 men. The less men, the more days.

200 yd. l. : 180 yd. l. The less length, the less days.

3 yd. w. : 4 yd. w. The more width, the more days.

2 yd. d. : 3 yd. d. The more depth, the more days.

8 hr. : 10 hr. The less hours, the more days.

: : 6 days : 24.3 days, *Ans.*

Art. 226.

(2.) $\frac{300}{800} = \frac{3}{8}$; $\frac{3}{8}$ of \$232 = \$87, A's share.

$\frac{500}{800} = \frac{5}{8}$; $\frac{5}{8}$ of \$232 = \$145, B's share.

(3.) \$70 + \$150 + \$80 = \$300, whole stock.

$\frac{70}{300} = \frac{7}{30}$; $\frac{7}{30}$ of \$120 = \$28, A's share.

$\frac{150}{300} = \frac{1}{2}$; $\frac{1}{2}$ of \$120 = \$60, B's share.

$\frac{80}{300} = \frac{4}{15}$; $\frac{4}{15}$ of \$120 = \$32, C's share.

(4.) \$200 + \$400 + \$600 = \$1200, whole stock. $\frac{200}{1200} = \frac{1}{6}$, $\frac{400}{1200} = \frac{1}{3}$, $\frac{600}{1200} = \frac{1}{2}$. $\frac{1}{6}$ of \$427.26 = \$71.21, A's share; $\frac{1}{3}$ of \$427.26 = \$142.42, B's share; and $\frac{1}{2}$ of \$427.26 = \$213.63, C's share.

(5.) $1 + 3 + 5 = 9$. $\frac{1}{9}$ of \$90 = \$10; $\frac{3}{9} = \frac{1}{3}$ of \$90 = \$30; $\frac{5}{9}$ of \$90 = \$50, *Ans.*

(6.) $2 + 3 + 5 + 7 = 17$. $\frac{2}{17}$ of \$735.93 = \$86.58; $\frac{3}{17}$ of \$735.93 = \$129.87; $\frac{5}{17}$ of \$735.93 = \$216.45; $\frac{7}{17}$ of \$735.93 = \$303.03, *Ans.*

(7.) $3 + 6 + 9 + 11 + 13 + 17 = 59$.
 $\frac{3}{59}$ of \$22361 = \$1137; $\frac{6}{59}$ of \$22361 = \$2274;
 $\frac{9}{59}$ of \$22361 = \$3411; $\frac{11}{59}$ of \$22361 = \$4169;
 $\frac{13}{59}$ of \$22361 = \$4927; $\frac{17}{59}$ of \$22361 = \$6443, *Ans.*

(8.) $\frac{1}{3}, \frac{3}{5}, \frac{7}{8} = \frac{40}{120}, \frac{72}{120}, \frac{105}{120}$. Since the denominators are the same, the fractions are to each other as their numerators. $40 + 72 + 105 = 217$. $\frac{40}{217}$ of \$692.23 = \$127.60; $\frac{72}{217}$ of \$692.23 = \$229.68; $\frac{105}{217}$ of \$692.23 = \$334.95, *Ans.*

Art. 227.

(1.) \$175 + \$500 + \$600 + \$210 + \$42.50 + \$20 + \$10 = \$1557.50

As \$1557.50 : \$175 : : \$934.50 : \$105.00, A's share.

As \$1557.50 : \$500 : : \$934.50 : \$300.00, B's share.

As \$1557.50 : \$600 : : \$934.50 : \$360.00, C's share.

As \$1557.50 : \$210 : : \$934.50 : \$126.00, D's share.

As \$1557.50 : \$42.50 : : \$934.50 : \$25.50, E's share.

As \$1557.50 : \$20 : : \$934.50 : \$12.00, F's share.

As \$1557.50 : \$10 : : \$934.50 : \$6.00, G's share.

(2.) \$234 + \$175 + \$326 = \$735; $492.45 \div 735 = \$0.67$ = sum paid on each dollar of indebtedness. $\$234 \times .67 = \156.78 , A; $\$175 \times .67 = \117.25 , B; $\$326 \times .67 = \218.42 , C.

(3.) \$25000 — \$4650 = \$20350.

37000 : 20350 : : \$1 : \$0.55, *Ans.*

Art. 228.

(1.) $\frac{48}{108} = \frac{4}{9}$; $\frac{36}{108} = \frac{1}{3}$; $\frac{24}{108} = \frac{2}{9}$. $\frac{4}{9}$ of 45 = 20, A's loss: $\frac{1}{3}$ of 45 = 15, B's loss: $\frac{2}{9}$ of 45 = 10, C's loss.

(2.) $\$10000 + \$15000 = \$25000$. $1125 \div 25000 = .04\frac{1}{2} = 4\frac{1}{2}\%$, gen. av. $\$2150 \times .04\frac{1}{2} = \96.75 , A's loss.

Art. 229.

(3.) $23 \times 27 = 621$; $21 \times 39 = 819$; $621 + 819 = 1440$. $\frac{621}{1440} = \frac{69}{160}$; $\frac{819}{1440} = \frac{91}{160}$; $\frac{69}{160}$ of \$54 = $\$23.28\frac{3}{4}$, A pays; $\frac{91}{160}$ of \$54 = $\$30.71\frac{1}{4}$, B pays.

(4.) $\$300 \times 5 = \1500 ; $\$400 \times 8 = \3200 ; $\$500 \times 3 = \1500 . $\$1500 + \$3200 + \$1500 = \6200 . $\frac{1500}{6200} = \frac{15}{62}$; $\frac{3200}{6200} = \frac{16}{31}$. $\frac{15}{62}$ of \$100 = $\$24.19\frac{11}{31}$, A's and C's loss; $\frac{16}{31}$ of \$100 = $\$51.61\frac{9}{31}$, B's loss.

(5.) $6 \times 30 = 180$; $5 \times 40 = 200$; $8 \times 28 = 224$. $180 + 200 + 224 = 604$; $\frac{180}{604} = \frac{45}{151}$; $\frac{200}{604} = \frac{50}{151}$; $\frac{224}{604} = \frac{56}{151}$. $\frac{45}{151}$ of \$18.12 = \$5.40, A: $\frac{50}{151}$ of \$18.12 = \$6, B: $\frac{56}{151}$ of \$18.12 = \$6.72, C.

(6.) A, $\$300 \times 8 = \2400 ; $\$300 + \$100 = \$400$;
 $\$400 \times 8 = \3200 . $\$2400 + \$3200 = \$5600$
 B, $\$600 \times 10 = \6000 ; $\$600 - \$300 = \$300$;
 $\$300 \times 6 = \1800 . $\$6000 + \$1800 = \$7800$
\$13400

As $\$13400 : \$5600 :: \$442.20 : \184.80 , A's.

$\$13400 : \$7800 :: \$442.20 : \257.40 , B's.

(7.) $\$800 \times 12 = \9600 ; $\$500 \times 12 = \6000 ;
 12 mo. — 7 mo. = 5 mo. $\$9600 - \$6000 = \$3600$; $\$3600 \div 5 = \720 , Ans.

Art. 230.

(2)	(3)
$\$2 \times 4 = \8	$\$8 \times 5 = \40
$\underline{6 \times 8 = 48}$	$\underline{4 \times 8 = 32}$
$\$8) \quad \$56(7 \text{ mo., Ans.}$	$\$12) \quad \$72(6 \text{ mo., Ans.}$

(4)	(5)
$\$250 \times 2 = \500	$\$100 \times 6 = \600
$500 \times 5 = 2500$	$75 \times 8 = 600$
$750 \times 8 = 6000$	$125 \times 12 = 1500$
<u>\$1500)</u> \$9000(6 mo., <i>Ans.</i>	<u>\$300)</u> \$2700(9 mo., <i>Ans.</i>

(6)
$\frac{1}{5}$ of \$200 = \$40
$\frac{2}{5}$ of \$200 = \$80
$\$40 \times 0 = 0$
$80 \times 5 = \$400$
$80 \times 10 = 800$
<u>\$200)</u> \$1200(6 mo., <i>Ans.</i>

Art. 231.

(2.) Counting from April 2d, it is 90 days to the first payment, and 150 days to the second.

$\$200 \times 90 = \18000	
$300 \times 150 = 45000$	
<u>\$500)</u> \$63000(126 da. from April 2d = Aug. 6th,	<i>Ans.</i>

(3.) Counting from July 6, when first bill is due,

$\$1250 \times 0 = 0$
$4280 \times 73 = 312440$
$675 \times 168 = 113400$
<u>\$6205)</u> \$425840(68.6 +

Counting 69 days from July 6th, brings the time to Sept. 13, *Ans.*

Art. 232.

(2)	(3)
6 lb. at 3 ct. = 18 ct.	25 lb. at 12 ct. = \$3.00
4 lb. at 8 ct. = 32 ct.	25 lb. at 18 ct. = 4.50
<u>10 lb. cost</u> 50 ct.	<u>40 lb. at 25 ct.</u> = 10.00
50 ct. \div 10 = 5 ct., <i>Ans.</i>	<u>90 lb. cost</u> \$17.50
	$\$17.50 \div 90 = \$0.19\frac{4}{9}$, <i>Ans.</i>

$$\begin{array}{r}
 \text{(4)} \\
 3 \text{ gal. cost} \quad \$0.00 \\
 12 \text{ gal. at } 50 \text{ ct.} = \underline{6.00} \\
 15 \text{ gal. cost} \quad \$6.00 \\
 \$6.00 \div 15 = \$0.40, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{(5)} \\
 10 \text{ at } \$3 = \$30.00 \\
 12 \text{ at } 4 = \underline{48.00} \\
 8 \text{ at } 9 = \underline{72.00} \\
 30 \text{ worth } \$150.00 \\
 \$150 \div 30 = \$5, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{(6)} \\
 6 \text{ to } 10 = 4 \text{ hr.} \quad 63^\circ \times 4 = 252^\circ \\
 10 \text{ to } 1 = 3 \text{ " } \quad 70^\circ \times 3 = 210^\circ \\
 1 \text{ to } 3 = 2 \text{ " } \quad 75^\circ \times 2 = 150^\circ \\
 3 \text{ to } 7 = 4 \text{ " } \quad 73^\circ \times 4 = 292^\circ \\
 7 \text{ to } 6 = \underline{11} \text{ " } \quad 55^\circ \times 11 = 605^\circ \\
 \text{24)} \quad \underline{1509^\circ} (62\frac{7}{8}^\circ, \text{ Ans.}
 \end{array}$$

INVOLUTION.

Art. 234.

- (2.) $65 \times 65 = 4225, \text{ Ans.}$
 (3.) $25 \times 25 \times 25 = 15625, \text{ Ans.}$
 (4.) $12 \times 12 \times 12 \times 12 = 20736, \text{ Ans.}$
 (5.) $10 \times 10 \times 10 \times 10 \times 10 = 100000, \text{ Ans.}$
 (6.) $9 \times 9 \times 9 \times 9 \times 9 \times 9 = 531441, \text{ Ans.}$
 (7.) $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256, \text{ Ans.}$
 (8.) $\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}, \text{ Ans.}$ (9.) $\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} = \frac{27}{64}, \text{ Ans.}$
 (10.) $\frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} = \frac{256}{625}, \text{ Ans.}$
 (11.) $\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} = \frac{32}{243}, \text{ Ans.}$
 (12.) $16\frac{1}{2} = \frac{33}{2}. \quad \frac{33}{2} \times \frac{33}{2} = \frac{1089}{4} = 272\frac{1}{4}, \text{ Ans.}$
 (13.) $12\frac{1}{2} = \frac{25}{2}. \quad \frac{25}{2} \times \frac{25}{2} \times \frac{25}{2} = \frac{15625}{8} = 1953\frac{1}{8}, \text{ Ans.}$
 (14.) $.25 \times .25 \times .25 \times .25 = .00390625, \text{ Ans.}$
 (15.) $14 \times 14 \times 14 = 2744, \text{ Ans.}$

(17.) $2\frac{1}{3} = \frac{7}{3}$. $\frac{7}{3} \times \frac{7}{3} \times \frac{7}{3} \times \frac{7}{3} \times \frac{7}{3} = \frac{16807}{243} = 69\frac{40}{243}$, Ans

EVOLUTION.

529(20 + 3 = 23, *Ans.*

56644(238, *Ans.*

43046721(6561, *Ans.*

390625(625, *Ans.*

625(25, *Ans.*

22)67

987656329(31427,

439929

$$\begin{array}{r}
 \text{(14)} \\
 \begin{array}{r}
 \dot{2}8944\dot{2}169(17013, \\
 \underline{1} \\
 27)189 \\
 \underline{189} \\
 3401)4421 \\
 \underline{3401} \\
 34023)102069 \\
 \underline{102069}
 \end{array}
 \end{array}$$

Ans.

$$\begin{array}{r}
 \text{(15)} \\
 \begin{array}{r}
 \dot{2}34.09(15.3, \\
 \underline{1} \\
 25)134 \\
 \underline{125} \\
 303)909 \\
 \underline{909}
 \end{array}
 \end{array}$$

Ans.

$$\begin{array}{r}
 \text{(16)} \\
 \begin{array}{r}
 \dot{1}45.20\dot{2}5(12.05, \\
 \underline{1} \\
 22)45 \\
 \underline{44} \\
 2405)12025 \\
 \underline{12025}
 \end{array}
 \end{array}$$

Ans.

$$\begin{array}{r}
 \text{(17)} \\
 \begin{array}{r}
 \dot{9}15.06\dot{2}5(30.25, \text{ Ans.} \\
 \underline{9} \\
 692)1506 \\
 \underline{1204} \\
 6045)30225 \\
 \underline{30225}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(18)} \\
 \begin{array}{r}
 \dot{.0}196(.14, \text{ Ans.} \\
 \underline{1} \\
 24)96 \\
 \underline{96}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(19)} \\
 \begin{array}{r}
 \dot{1}.008016(1.004, \text{ Ans.} \\
 \underline{1} \\
 2004)008016 \\
 \underline{8016}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(20)} \\
 \begin{array}{r}
 \dot{.00}822649(.0907, \text{ Ans.} \\
 \underline{81} \\
 1807)12649 \\
 \underline{12649}
 \end{array}
 \end{array}$$

$$(21.) \sqrt{25} = 5, \sqrt{729} = 27; \sqrt{\frac{25}{729}} = \frac{5}{27}, \text{ Ans.}$$

$$(22.) \frac{847}{1183} = \frac{121}{169}; \sqrt{121} = 11, \sqrt{169} = 13; \text{ Ans.} = \frac{11}{13}.$$

$$(23.) 30\frac{1}{4} = \frac{121}{4}; \sqrt{1\frac{21}{4}} = \frac{11}{2} = 5\frac{1}{2}, \text{ Ans.}$$

(24)	(25)	(27)
$\dot{1}0(3.162277+,$	$\dot{2}(1.41421+,$	$\dot{6}\frac{2}{5} = 6.4(2.5298+,$
$\underline{9} \quad \text{Ans.}$	$\underline{1} \quad \text{Ans.}$	$\underline{4} \quad \text{Ans.}$
61)100	24)100	$6\frac{2}{5} = 6.4(2.5298+,$
$\underline{61}$	$\underline{96}$	$\underline{4} \quad \text{Ans.}$
626)3900	281)400	45)240
$\underline{3756}$	$\underline{281}$	$\underline{225}$
6322)14400	2824)11900	502)1500
$\underline{12644}$	$\underline{11296}$	$\underline{1004}$
63242)175600	28282)60400	5049)49600
$\underline{126484}$	$\underline{56564}$	$\underline{45441}$
632447)4911600	282841)383600	50588)415900
$\underline{4427129}$	$\underline{282841}$	$\underline{404704}$
6324547)48447100		
$\underline{44271829}$		

(28)	(26)
$384\frac{4}{7} = 384.5714285714(19.61049+, \text{Ans.}$	$\frac{2}{3} = .666666+(.81649+, \text{Ans.}$
$\underline{1}$	$\underline{64}$
29)284	161)266
$\underline{261}$	$\underline{161}$
386)2357	1626)10566
$\underline{2316}$	$\underline{9756}$
3921)4114	16324)81066
$\underline{3921}$	$\underline{65296}$
392204)1932857	163289)1577066
$\underline{1568816}$	$\underline{1469601}$
3922089)36404114	
$\underline{35298801}$	

Art. 239.

(2.) $16 = 2 \times 2 \times 2 \times 2: \sqrt{16} = 2 \times 2 = 4, \text{Ans.}$

(3.) $36 = 2 \times 2 \times 3 \times 3: \sqrt{36} = 2 \times 3 = 6, \text{Ans.}$

$$(4.) 100 = 2 \times 2 \times 5 \times 5 : \sqrt{100} = 2 \times 5 = 10, \text{ Ans.}$$

$$(5.) 225 = 3 \times 3 \times 5 \times 5 : \sqrt{225} = 3 \times 5 = 15, \text{ Ans.}$$

$$(6.) \sqrt{(16 \times 25)} = 4 \times 5 = 20, \text{ Ans.}$$

$$(7.) \sqrt{(36 \times 49)} = 6 \times 7 = 42, \text{ Ans.}$$

$$(8.) \sqrt{(64 \times 81)} = 8 \times 9 = 72, \text{ Ans.}$$

$$(9.) \sqrt{(121 \times 25)} = 11 \times 5 = 55, \text{ Ans.}$$

Art. 240.

(1)	(2)	(3)
$30^2 = 900$	$100^2 = 10000$	$45^2 = 2025$
$40^2 = 1600$	$60^2 = 3600$	$60^2 = 3600$
$\sqrt{2500} = 50, \text{ Ans.}$	$\sqrt{6400} = 80, \text{ Ans.}$	$\sqrt{5625} = 75, \text{ Ans.}$

(4.) $60^2 = 3600$, $37^2 = 1369$; $3600 - 1369 = 2231$;
 $\sqrt{2231} = 47.2334 + =$ width of street from foot of ladder
 on one side. $60^2 = 3600$, $23^2 = 529$; $3600 - 529 = 3071$;
 $\sqrt{3071} = 55.4166 + =$ width of street from foot of ladder
 on the other side. $47.2344 + 55.4166 = 102.65, \text{ Ans.}$

(5.) $600^2 = 360000$, $140^2 = 19600$; $360000 - 19600 =$
 340400 ; $\sqrt{340400} = 583.43 +$; $100 \div 2 = 50$; $583.43 -$
 $50. = 533.43 +, \text{ Ans.}$

<p style="text-align: center;">(6)</p> $20^2 = 400$ $16^2 = 256$ <hr style="width: 50px; margin-left: 0;"/> 656 <hr style="width: 50px; margin-left: 0;"/> Square of base = 656	<p>The square root of 656, will give the length of the diagonal line joining opposite corners of the floor of the room: this is the base of the triangle, of which the hypotenuse is required.</p>
--	--

$12^2 = \text{perpendicular}^2 = 144$; $656 + 144 = 800$; $\sqrt{800}$
 $= 28.28 +, \text{ Ans.}$
 Key 14.

Art. 241.

$\begin{array}{r} \text{(1)} \\ \dot{6}\dot{2}4\dot{1} \overline{)79 \text{ rd., } Ans.} \\ \underline{49} \\ 149)1341 \\ \underline{1341} \end{array}$	$\begin{array}{r} \text{(2)} \\ 8 \text{ sq. ft. } 4 \text{ sq. in.} = 1156 \text{ sq. in.} \\ \dot{1}\dot{1}\dot{5}\dot{6} \overline{)34 \text{ in.} = 2 \text{ ft. } 10 \text{ in., } Ans.} \\ \underline{9} \\ 64)256 \\ \underline{256} \end{array}$
---	--

(3.) $\sqrt{4096} = 64 \text{ yd., } Ans.$

(4.) $4 \times 4 = 16$; $16 \times 9 = 144$; $\sqrt{144} = 12$, *Ans.*
 Or, $\sqrt{(16 \times 9)} = 4 \times 3 = 12 \text{ rd., } Ans.$

(5.) There are 43560 sq. ft. in 1 acre.
 $\sqrt{43560} = 208.71 + \text{ft., side of acre.}$

Art. 244.

$\begin{array}{r} \text{(3)} \\ \dot{2}19\dot{7} \overline{)13} \\ 1 \\ \hline 300 \overline{)1197} \\ 90 \\ 9 \\ \hline 399 \overline{)1197} \\ 138\dot{2}\dot{4} \overline{)24} \\ 8 \\ \hline 1200 \overline{)5824} \\ 240 \\ 16 \\ \hline 1456 \overline{)5824} \\ \frac{13}{24}, Ans. \end{array}$	$\begin{array}{r} \text{(4)} \\ \dot{8}00000000 \overline{.)928, } Ans. \\ 729 \\ \hline 24300 \overline{)71000} \\ 540 \\ 4 \\ \hline 24844 \overline{)49688} \\ 2539200 \overline{)21312000} \\ 22080 \\ 64 \\ \hline 2561344 \overline{)20490752} \end{array}$
---	---

(5)

 $9\dot{1}12\dot{5}(45, \text{Ans.}$

64

$$\begin{array}{r}
 4 \times 4 \times 300 = 4800 \\
 4 \times 5 \times 30 = 600 \\
 5 \times 5 = 25 \\
 \hline
 5425 \overline{)27125}
 \end{array}$$

(6)

 $19\dot{5}11\dot{2}(58,$ 125 *Ans.*

$$\begin{array}{r}
 5 \times 5 \times 300 = 7500 \\
 5 \times 8 \times 30 = 1200 \\
 8 \times 8 = 64 \\
 \hline
 8764 \overline{)70112}
 \end{array}$$

(7)

 $91267\dot{3}(97, \text{Ans.}$

729

$$\begin{array}{r}
 24300 \\
 1890 \\
 49 \\
 \hline
 26239 \overline{)183673}
 \end{array}$$

(8)

 $\dot{1}225043(107,$ 1 *Ans.*

$$\begin{array}{r}
 1 \times 1 \times 300 = 300 \\
 10 \times 10 \times 300 = 30000 \\
 10 \times 7 \times 30 = 2100 \\
 7 \times 7 = 49 \\
 \hline
 32149 \overline{)225043}
 \end{array}$$

(9)

 $1\dot{3}3120\dot{5}\dot{3}(237, \text{Ans.}$

8

$$\begin{array}{r}
 2 \times 2 \times 300 = 1200 \\
 2 \times 3 \times 30 = 180 \\
 3 \times 3 = 9 \\
 \hline
 1389 \\
 23 \times 23 \times 300 = 158700 \\
 23 \times 7 \times 30 = 4830 \\
 7 \times 7 = 49 \\
 \hline
 163579 \overline{)1145053}
 \end{array}$$

(10)

102503232(468, *Ans.*

64

$4 \times 4 \times 300 = 4800$	38503
$4 \times 6 \times 30 = 720$	
$6 \times 6 = 36$	
<u>5556</u>	33336
$46 \times 46 \times 300 = 634800$	5167232
$46 \times 8 \times 30 = 11040$	
$8 \times 8 = 64$	
<u>645904</u>	5167232

(11)

529475129(809, *Ans.*

512

$8 \times 8 \times 300 = 19200$	17475
$80 \times 80 \times 300 = 1920000$	17475129
$80 \times 9 \times 30 = 21600$	
$9 \times 9 = 81$	
<u>1941681</u>	17475129

(12)

958585256(986, *Ans.*

729

$9 \times 9 \times 300 = 24300$	229585
$9 \times 8 \times 30 = 2160$	
$8 \times 8 = 64$	
<u>26524</u>	212192
$98 \times 98 \times 300 = 2881200$	17393256
$98 \times 6 \times 30 = 17640$	
$6 \times 6 = 36$	
<u>2898876</u>	17393256

(13)

 $\dot{1}47\dot{6}0\dot{2}1\dot{3}67\dot{7}$ (2453, *Ans.*)

8

$2 \times 2 \times 300 = 1200$	6760
$2 \times 4 \times 30 = 240$	
$4 \times 4 = 16$	
1456	5824
$24 \times 24 \times 300 = 172800$	936213
$24 \times 5 \times 30 = 3600$	
$5 \times 5 = 25$	
176425	882125
$245 \times 245 \times 300 = 18007500$	54088677
$245 \times 3 \times 30 = 22050$	
$3 \times 3 = 9$	
18029559	54088677

(14)

 $\dot{1}2810\dot{0}28392\dot{1}$ (5041, *Ans.*)

125

$5 \times 5 \times 300 = 7500$	3100
$50 \times 50 \times 300 = 750000$	3100283
$50 \times 4 \times 30 = 6000$	
$4 \times 4 = 16$	
756016	3024064
$504 \times 504 \times 300 = 76204800$	76219921
$504 \times 1 \times 30 = 15120$	
$1 \times 1 = 1$	
76219921	76219921

$$(15) \quad 53.157376 (3.76, \text{Ans. } 27)$$

$3 \times 3 \times 300 = 2700$	26157
$3 \times 7 \times 30 = 630$	
$7 \times 7 = 49$	
<u>3379</u>	<u>23653</u>
$37 \times 37 \times 300 = 410700$	2504376
$37 \times 6 \times 30 = 6660$	
$6 \times 6 = 36$	
<u>417396</u>	<u>2504376</u>

$$(16) \quad .199176704 (.584, \text{Ans. } 125)$$

$5 \times 5 \times 300 = 7500$	74176
$5 \times 8 \times 30 = 1200$	
$8 \times 8 = 64$	
<u>8764</u>	<u>70112</u>
$58 \times 58 \times 300 = 1009200$	4064704
$58 \times 4 \times 30 = 6960$	
$4 \times 4 = 16$	
<u>1016176</u>	<u>4064704</u>

$$(17.) \quad \sqrt[3]{216} = 6. \quad \text{Ans. } \frac{6}{7}.$$

$$\sqrt[3]{343} = 7.$$

$$(18.) \quad \sqrt[3]{2744} = 14. \quad \text{Ans. } \frac{14}{9}.$$

$$\sqrt[3]{6859} = 19.$$

$$(19.) \quad \frac{48778}{118638} = \frac{24389}{59319}$$

$$\sqrt[3]{24389} = 29. \quad \text{Ans. } \frac{29}{39}.$$

$$\sqrt[3]{59319} = 39.$$

$$(20.) \quad 5\frac{104}{125} = 7\frac{29}{125}$$

$$\sqrt[3]{729} = 9.$$

$$\sqrt[3]{125} = 5. \quad \text{Ans. } \frac{9}{5} = 1\frac{4}{5}.$$

(21)	2(1.259+, Ans. 1
$300 + 60 + 4 = 364$ $12 \times 12 \times 300 = 43200$ $12 \times 5 \times 30 = 1800$ $5 \times 5 = 25$ <u>45025</u>	<u>1000</u> <u>728</u> <u>272000</u> <u>225125</u> <u>4687500</u> <u>33750</u> <u>81</u> <u>4721331</u>
	<u>42491979</u>

(22)	9(2.080+, Ans. 8
$2 \times 2 \times 300 = 1200$ $20 \times 20 \times 300 = 120000$ $20 \times 8 \times 30 = 4800$ $8 \times 8 = 64$ <u>124864</u>	<u>1000</u> <u>1000000</u> <u>998912</u> <u>1088000</u>
$208 \times 208 \times 300 = 12979200$	

(23)	200(5.848+, Ans. 125
$5 \times 5 \times 300 = 7500$ $5 \times 8 \times 30 = 1200$ $8 \times 8 = 64$ <u>8764</u>	<u>75000</u> <u>70112</u> <u>4888000</u> <u>6960</u> <u>16</u> <u>1016176</u>
$58 \times 58 \times 300 = 1009200$ $58 \times 4 \times 30 = 6960$ $4 \times 4 = 16$ <u>1016176</u>	<u>4064704</u> <u>823296000</u> <u>140160</u> <u>64</u>
$584 \times 584 \times 300 = 102316800$	
$584 \times 8 \times 30 = 140160$	
$8 \times 8 = 64$	<u>819656192</u>

$$\begin{array}{r}
 (24) \quad \\
 9\frac{1}{8} = 9.166666 + (2.092 +, \text{Ans.} \\
 \quad \quad \quad 8 \\
 \begin{array}{r|l}
 2 \times 2 \times 300 = 1200 & 1166 \\
 20 \times 20 \times 300 = 120000 & 116666 \\
 20 \times 9 \times 30 = 5400 & \\
 9 \times 9 = 81 & \\
 \hline
 & 125481 \\
 209 \times 209 \times 300 = 13104300 & 37337666 \\
 209 \times 2 \times 30 = 12540 & \\
 2 \times 2 = 4 & \\
 \hline
 & 13116844 \\
 \hline
 & 26233688
 \end{array}
 \end{array}$$

Art. 245.

(1.) $\sqrt[3]{1953.125} = 12.5 \text{ ft., Ans.}$

(2.) $64 \times 3 \times 3 \times 3 = 1728 \text{ cu. in.} = 1 \text{ cu. ft., one side of which} = 1 \text{ ft., Ans.}$

(3.) $\sqrt[3]{512} = 8 \text{ half in.} = 4 \text{ in., Ans.}$

(4.) $450 \text{ cu. yd. } 17 \text{ cu. ft.} = 12167 \text{ cu. ft.; } \sqrt[3]{12167} = 23 \text{ ft., Ans.}$

(5.) $288 \times 216 \times 48 = 2985984, \sqrt[3]{2985984} = 144 \text{ ft., Ans.}$

(6.) $1728 \times 3 = 5184, \sqrt[3]{5184} = 17.306 + \text{in., Ans.}$

MENSURATION.**Art. 247.**

(1.) $17 \text{ ft.} \times 15 \text{ ft.} = 255 \text{ sq. ft., Ans.}$

(2.) $120 \text{ rd.} \times 84 \text{ rd.} = 10080 \text{ sq. rd.} = 63 \text{ A., Ans.}$

(3.) $65 \text{ rd.} \times 65 \text{ rd.} = 4225 \text{ sq. rd.} = 26 \text{ A. } 65 \text{ sq. rd.}$

(4.) $35 \text{ rd.} \times 16 \text{ rd.} = 560 \text{ sq. rd.} = 3 \text{ A. } 80 \text{ sq. rd., Ans.}$

$$\begin{aligned}
 (5.) \quad 30 \text{ ft.} \times 30 \text{ ft.} &= 900 \text{ sq. ft.} = 100 \text{ sq. yd.} \\
 15 \text{ ft.} \times 15 \text{ ft.} &= 225 \text{ sq. ft.,} \times 2 = 450 \text{ sq. ft.} = 50 \text{ sq. yd.} \\
 \text{Diff.} &= 50 \text{ sq. yd.}
 \end{aligned}$$

$$(7.) \quad 5 \text{ ft. } 6 \text{ in.} = 5\frac{1}{2} \text{ ft.; } 1 \text{ ft. } 8 \text{ in.} = 1\frac{2}{3} \text{ ft.; } \frac{1}{2} \text{ ft.} \times \frac{5}{3} \text{ ft.} = \frac{5}{6} \text{ sq. ft.} = 9\frac{1}{6} \text{ sq. ft., } \textit{Ans.}$$

$$(8.) \quad 25 \text{ ft. } 9 \text{ in.} = 25\frac{3}{4} \text{ ft.} = \frac{103}{4} \text{ ft.; } 21 \text{ ft. } 3 \text{ in.} = 21\frac{1}{4} \text{ ft.} = \frac{85}{4} \text{ ft.; } \frac{103}{4} \times \frac{85}{4} = \frac{8755}{16} \text{ sq. ft.} = 547\frac{3}{16} \text{ sq. ft.} = 60 \text{ sq. yd. } 7 \text{ sq. ft. } 27 \text{ sq. in., } \textit{Ans.}$$

$$(9.) \quad 80 \text{ sq. ft.} \div 10 \text{ ft.} = 8 \text{ ft., } \textit{Ans.}$$

$$(10.) \quad 18 \text{ ft.} \times 15 \text{ ft.} = 270 \text{ sq. ft.} = 30 \text{ sq. yd.; } 30 \text{ sq. yd.} \div 1\frac{1}{2} \text{ yd.} = 20 \text{ yd., } \textit{Ans.}$$

$$(11.) \quad 3 \text{ yd.} \times 1\frac{1}{2} \text{ yd.} = 4\frac{1}{2} \text{ sq. yd.; } 4\frac{1}{2} \div \frac{3}{4} = \frac{3}{2} \times \frac{4}{3} = 6 \text{ yd., } \textit{Ans.}$$

$$(12.) \quad 21 \text{ ft. } 3 \text{ in.} = 21.25 \text{ ft.; } 13 \text{ ft. } 6 \text{ in.} = 13.5 \text{ ft.; } 21.25 \text{ ft.} \times 13.5 \text{ ft.} = 286.875 \text{ sq. ft.; } 1\frac{1}{4} \text{ yd.} = 3\frac{3}{4} = 3.75 \text{ ft.; } 286.875 \text{ sq. ft.} \div 3.75 \text{ ft.} = 76.5 \text{ ft.} = 25.5 \text{ yd.} = 25\frac{1}{2} \text{ yd.}$$

$$(13.) \quad 160 \text{ sq. rd. in } 1 \text{ A. } 160 \div 15 = 10\frac{2}{3} \text{ rd., } \textit{Ans.}$$

Art. 248.

$$\begin{array}{rcl}
 (1.) \quad \text{ft.} & \text{in.} & 61 \text{ in.} \div 2 = 30\frac{1}{2} \text{ in.,} \times 11 \text{ in.} = 335\frac{1}{2} \\
 & 2 & \text{sq. in.: } 335\frac{1}{2} \text{ sq. in.} \div 144 = 2 \text{ sq. ft. } 47\frac{1}{2} \\
 & 2 & \text{sq. in., } \textit{Ans.} \\
 & \hline
 & 5 & 1 = 61 \text{ in.}
 \end{array}$$

$$(2.) \quad 25 \text{ rd.} + 19 \text{ rd.} = 44 \text{ rd.; } 44 \text{ rd.} \div 2 = 22 \text{ rd.,} \times 32 \text{ rd.} = 704 \text{ sq. rd.,} \div 160 = 4 \text{ A. } 64 \text{ sq. rd., } \textit{Ans.}$$

$$(3.) \quad 10 \text{ ft. } 8 \text{ in.} = 128 \text{ in.; } 6 \text{ ft. } 2 \text{ in.} = 74 \text{ in.; } 128 + 74 = 202 \text{ in.,} \div 2 = 101 \text{ in.; } 12 \text{ ft.} = 144 \text{ in.; } 101 \times 144 = 14544 \text{ sq. in.} = 101 \text{ sq. ft.} = 11 \text{ sq. yd. } 2 \text{ sq. ft., } \textit{Ans.}$$

Art. 249.

$$(1.) \quad 15 \text{ ft.} \times 12 \text{ ft.} = 180 \text{ sq. ft.,} \div 2 = 90 \text{ sq. ft., } \textit{Ans.}$$

(2.) $44 \text{ rd.} \times 18 \text{ rd.} = 792 \text{ sq. rd.}, \div 2 = 396 \text{ sq. rd.} : 396 \text{ sq. rd.} \div 160 = 2 \text{ A. } 76 \text{ sq. rd.}, \text{Ans.}$

(3.) $12\frac{1}{2} \text{ ft.} \times 16\frac{3}{4} \text{ ft.} = \frac{1675}{8} \text{ sq. ft.} = 209\frac{3}{8} \text{ sq. ft.}; 209\frac{3}{8} \div 2 = 104\frac{11}{16} \text{ sq. ft.} = 11 \text{ sq. yd. } 5 \text{ sq. ft. } 99 \text{ sq. in.}, \text{Ans.}$

(4.) $13 + 14 + 15 = 42, \div 2 = 21. \quad 21 - 13 = 8, 21 - 14 = 7, 21 - 15 = 6. \quad 21 \times 8 \times 7 \times 6 = 7056 : \text{its square root} = 84 \text{ sq. ft.}, \text{Ans.}$

(5.) $30 + 40 + 50 = 120, \div 2 = 60. \quad 60 - 30 = 30, 60 - 40 = 20, 60 - 50 = 10. \quad 60 \times 30 \times 20 \times 10 = 360000 : \sqrt{360000} = 600 \text{ sq. ft.} : 600 \text{ sq. ft.} = 66 \text{ sq. yd. } 6 \text{ sq. ft.}, \text{Ans.}$

Art. 250.

(1.) $50 \text{ rd.} \times 30 \text{ rd.} = 1500 \text{ sq. rd.}, \div 2 = 750 \text{ sq. rd.} : 50 \text{ rd.} \times 20 \text{ rd.} = 1000 \text{ sq. rd.}, \div 2 = 500 \text{ sq. rd.}; 750 \text{ sq. rd.} + 500 \text{ sq. rd.} = 1250 \text{ sq. rd.} = 7 \text{ A. } 130 \text{ sq. rd.}, \text{Ans.}$

Art. 251.

(1.) $48 \text{ ft.} \times 3.1416 = 150.7968 \text{ ft.} = 150 \text{ ft. } 9.56 \text{ in.}$

(2.) $15 \text{ ft.} \div 3.1416 = 4.7746 \text{ ft.} = 4 \text{ ft. } 9.3 \text{ in. nearly.}$

(3.) $4 \times 3.1416 = 12.5664 \text{ ft.} = 12 \text{ ft. } 6.8 \text{ in. nearly.}$

(4.) $12 \text{ ft. } 5 \text{ in.} = 12.4166 + \text{ft.}; 12.4166 \text{ ft.} \div 3.1416 = 3.952338 \text{ ft.} = 3 \text{ ft. } 11.43 \text{ in. nearly, Ans.}$

(5.) $7912 \text{ mi.} \times 3.1416 = 24856 + \text{mi.}, \text{Ans.}$

Art. 252.

(1.) $21 \times 21 = 441 : 3.1416 \times 441 = 1385.4456 \text{ sq. ft.} = 153 \text{ sq. yd. } 8 \text{ sq. ft. } 64 \text{ sq. in.}, \text{Ans.}$

NOTE.—To find the diameter when the area is given, divide the area by .7854; the square root of the quotient will be the diameter.

(2.) $6 \text{ sq. ft. } 98.115 \text{ sq. in.} = 962.115 \text{ sq. in.}; 962.115 \div .7854 = 1225 : \sqrt{1225} = 35 \text{ in.}, = 2 \text{ ft. } 11 \text{ in.} = \text{diameter.}$
 $35 \text{ in.} \times 3.1416 = 109.956 \text{ in.} = 9 \text{ ft. } 1.9 + \text{in.} = \text{circum.}$

$$(3.) 160 \text{ rd.} \div .7854 = 203.71785077 + ; \sqrt{203.71785077} = 14.2729 ; 14.2729 \div 2 = 7.1364 \text{ rd.} = 7 \text{ rd. } 2 \text{ ft. } 3 \text{ in., } Ans.$$

$$(4.) 10 \div 2 = 5 = \text{one radius} ; 5^2 = 25 : 16 \div 2 = 8 = \text{one radius} ; 8^2 = 64. \quad 25 \times 3.1416 = 78.5400 ; 64 \times 3.1416 = 201.0624 : 201.0624 - 78.5400 = 122.5224 \text{ sq. ft.} ; .5224 \times 144 = 75 \text{ sq. in. } Ans. 122 \text{ sq. ft. } 75 \text{ sq. in.}$$

$$(5.) 1 \text{ sq. ft.} = 144 \text{ sq. in.} \quad 144 \div .7854 = 183.3460 \text{ sq. in.} : \sqrt{183.3460} = 13.54 \text{ in., } Ans.$$

Art. 254.

$$(1.) 37 \times 37 \times 6 = 8214 \text{ sq. in.} = 6 \text{ sq. yd. } 3 \text{ sq. ft. } 6 \text{ sq. in., } Ans.$$

$$(2.) 4 + 4 + 4 = 12 \text{ ft., } \times 5 \text{ ft.} = 60 \text{ sq. ft.} = \text{convex surface.}$$

$$\left. \begin{array}{l} 6 - 4 = 2 \\ \frac{4+4+4}{2} = 6. \quad 6 - 4 = 2 \\ 6 - 4 = 2 \end{array} \right\} 6 \times 2 \times 2 \times 2 = 48.$$

$$\sqrt{48} = 6.92 + ; 6.92 + \times 2 = 13.85 \text{ sq. ft.} = \text{area of } 2 \text{ bases. } 60 \text{ sq. ft.} + 13.85 \text{ sq. ft.} = 73.85 + \text{ sq. ft., } Ans.$$

$$(3.) \left. \begin{array}{l} 3 \text{ ft. } 6 \text{ in.} = 3\frac{1}{2} \text{ ft.} = \frac{7}{2} ; \frac{7}{2} \times 2 = 7 \\ 2 \text{ ft. } 9 \text{ in.} = 2\frac{3}{4} \text{ ft.} = \frac{11}{4} ; \frac{11}{4} \times 2 = 5\frac{1}{2} \\ 1 \text{ ft. } 10 \text{ in.} = 1\frac{5}{6} \text{ ft.} = \frac{11}{6} \end{array} \right\} = 12\frac{1}{2} \text{ or } \frac{25}{2}.$$

$$\frac{25}{2} \times \frac{11}{6} = \frac{275}{12} = \text{convex surface} ; \frac{7}{2} \times \frac{11}{4} \times 2 = \frac{77}{4} \text{ or } \frac{231}{12} = \text{areas of } 2 \text{ bases} : \frac{275}{12} + \frac{231}{12} = \frac{506}{12} = 42\frac{1}{6} \text{ sq. ft., } Ans.$$

$$(4.) 3.1416 \times 4 \text{ ft. (diameter)} = 12.5664 = \text{circumference.}$$

$$12.5664 \times 5 = 62.8320 = \text{convex surface.}$$

$$2 \times 2 \times 3.1416 \times 2 = 25.1328 = \text{areas of } 2 \text{ bases.}$$

$$\underline{87.96 +} \text{ sq. ft., } Ans.$$

Art. 255.

$$(2.) 24 \text{ ft.} \times 18\frac{1}{2} \text{ ft.} \times 10\frac{7}{12} \text{ ft.} = 4699 \text{ cu. ft.} = 174 \text{ cu. yd. } 1 \text{ cu. ft., } Ans.$$

(3.) Area of base $= 1.73 +$ sq. ft.; 1.73 sq. ft. $\times 14$ ft. $= 24\frac{1}{4}$ cu. ft. nearly, *Ans.*

(4.) $2 \times 2 \times 3.1416 \times 12 = 150.8$ cu. ft., *Ans.*

(5.) $9\frac{1}{4}$ in. $= \frac{37}{4}$; $\frac{1}{2}$ of $\frac{37}{4} = \frac{37}{8}$; $(\frac{37}{8})^2 \times 3.1416 \times 8 = 537.6$ cu. in., *Ans.*

Art. 256.

(1.) 5 ft. 4 in. $= 5\frac{1}{3}$ ft.; $5\frac{1}{3}$ ft. $\times 3 = 16$ ft. = perimeter of base. $7\frac{1}{2}$ ft. $\times 16 = 120$ sq. ft.; 120 sq. ft. $\div 2 = 60$ sq. ft. = area of 3 sides. $5\frac{1}{3} \times 3 = 16$. $16 \div 2 = 8$; $8 - 5\frac{1}{3} = 2\frac{2}{3}$; $2\frac{2}{3} = \frac{8}{3}$; $8 \times \frac{8}{3} \times \frac{8}{3} \times \frac{8}{3} = \frac{4096}{27} = 151.70 +$. $\sqrt{151.70} = 12.3 +$ sq. ft. = area of base. 60 sq. ft. $+ 12.3 +$ sq. ft. $= 72.3 +$ sq. ft., *Ans.*

(2.) $8\frac{1}{2}$ ft. $\times 3.1416 = 26.7036$ ft. = circum. of base. $26.7036 \times 25 \div 2 = 333.79 +$, *Ans.*

(3.) $2\frac{1}{2}$ ft. $\times 3.1416 \times 4\frac{7}{12}$ ft. $\div 2 = 21.008$ sq. ft. = convex surface. $2\frac{1}{2}$ ft. $= \frac{5}{2}$; $\div 2 = \frac{5}{4}$; $(\frac{5}{4})^2 \times 3.1416 = 6.68$ sq. ft. = area of base. $21.008 + 6.68 = 27.6 +$ sq. ft., *Ans.*

Art. 257.

(1.) 5 ft. $\times 5$ ft. $= 25$ sq. ft. = area of base. 25 sq. ft. $\times 21$ ft. $\div 3 = 175$ cu. ft., *Ans.*

(2.) $(5)^2 \times 3.1416 \times 15 \div 3 = 392.7$ cu. ft., *Ans.*

(3.) 720 ft. $= 240$ yd.; 477 ft. $= 159$ yd.; $(240 \text{ yd})^3 \times 159 \text{ yd.} \div 3 = 3052800$ cu. yd., *Ans.*

(4.) $37\frac{3}{4}$ ft. $= \frac{113}{4}$; $\div 2 = \frac{113}{8}$; $(\frac{113}{8})^2 \times 3.1416 = 1114.3 +$ sq. ft. = area of base. $1114.3 +$ sq. ft. $\times 79\frac{3}{4}$ ft., $\div 3 = 29622 +$ cu. ft., *Ans.*

Art. 258.

(2.) $(4\frac{1}{2} \text{ ft.})^2 \times 3.1416 = 63.6 +$ sq. ft., *Ans.*

(3.) $(7912)^2 \times 3.1416 = 196663355.75$ sq. mi., *Ans.*

Art. 259.

$$(1.) 13 \times 13 \times 13 \times .5236 = 1150.3 + \text{ cu. ft., } Ans.$$

$$(2.) 2\frac{1}{2} \text{ ft.} = \frac{5}{2}: \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2} \times .5236 = 8.18 + \text{ cu. ft., } Ans.$$

$$(3.) 1 \text{ cu. ft.} = 1728 \text{ cu. in.}; 1728 \div .5236 = 3300.229;$$

$$\sqrt[3]{3300.229} = 14.9 \text{ in. nearly, } Ans.$$

Art. 260.

(1.) $20\frac{1}{2} \times 16\frac{1}{4} =$ area of ceiling; $20\frac{1}{2} \times 10\frac{1}{2} \times 2 =$ area of 2 sides; $16\frac{1}{4} \times 10\frac{1}{2} \times 2 =$ area of other 2 sides. Add these amounts together, and deduct $6\frac{1}{4} \times 4\frac{1}{6}$, fire-place; $7 \times 4\frac{1}{6}$, door; $6 \times 3\frac{1}{4} \times 2$, two windows.

(2.) $20 \times 10\frac{1}{3} \times 2 =$ area of two sides; $14\frac{1}{2} \times 10\frac{1}{3} \times 2 =$ area of other 2 sides. Deduct $4 \times 4\frac{1}{3}$, fire-place; $6 \times 3\frac{1}{6} \times 2$, two windows. The remainder is in sq. ft. Divide by 9, and multiply by 27 ct. = \$19.73 +, *Ans.*

$$(3.) \quad \begin{array}{rcl} 21 \text{ yd.} \times 15 \text{ yd.} & = & 315 \text{ sq. yd.} \\ 5 \text{ ft.} = 1\frac{2}{3} \text{ yd.} & 21 \text{ yd.} \times 1\frac{2}{3} \text{ yd.} & = \quad 35 \text{ sq. yd.} \\ & & \underline{280 \text{ sq. yd.}} \end{array}$$

$$35 \times .36 = \$12.60; 280 \times .24 = \$67.20; \$12.60 + \$67.20 = \$79.80, \text{ } Ans.$$

$$(4.) 15\frac{1}{2} \text{ ft.} \times 12\frac{1}{2} \text{ ft.} \times 2 = 387.5 \text{ sq. ft.} = 43.06 \text{ sq. yd.}; 43.06 \text{ sq. yd.} @ 10 \text{ ct.} = \$4.31, \text{ } Ans.$$

$$(5.) 6 \text{ ft. } 11 \text{ in.} + 5 \text{ ft. } 4 \text{ in.} + 4 \text{ ft. } 3 \text{ in.}, \times 7 = 115\frac{1}{2} \text{ ft.}, \times 3\frac{1}{2} \text{ ft.} = 404\frac{1}{4} \text{ sq. ft.}, \times 16 \text{ ct.} = \$64.68, \text{ } Ans.$$

$$(6.) 36\frac{1}{4} \text{ ft.} \times 16\frac{1}{2} \text{ ft.} = 598 \text{ sq. ft.} = 5.98 \text{ squares}; 5.98 \times \$3.00 = \$17.94, \text{ } Ans.$$

$$(7.) 40 \text{ ft.} \times 18\frac{1}{2} \text{ ft.} \times 2 = 1480 \text{ sq. ft.} = 14.80 \text{ squares}; 14.80 \times \$3.50 = \$51.80, \text{ } Ans.$$

Art. 261.

$$(1.) 16 \times 1\frac{1}{4} = 20 \text{ ft., } Ans.$$

$$(2.) 12\frac{1}{2} \times 2\frac{1}{4} \times 2 = 56\frac{1}{4} \text{ ft., } Ans.$$

$$(3.) 15 \times \frac{1}{3} \times 3 = 15 \text{ ft., } Ans.$$

$$(4.) 12 \times 2 \times 24 = 576 \text{ ft., } Ans.$$

$$(5.) 1 \text{ ft. 3 in.} + 11 \text{ in.} = 2\frac{1}{6} \text{ ft., } \div 2 = 1\frac{1}{2} \text{ ft.} = \text{average width. } 12\frac{1}{2} \times 1\frac{1}{2} = 13\frac{1}{4} \text{ ft., } Ans.$$

Art. 262.

$$(1.) 97 \text{ ft. 5 in.} = 97.416\frac{1}{2} \text{ ft.; } 18 \text{ ft. 3 in.} = 18.25 \text{ ft.; } 2 \text{ ft. 3 in.} = 2.25 \text{ ft.: } 97.416 \text{ ft.} \times 18.25 \text{ ft.} \times 2.25 \text{ ft.} = 4000.1445 \text{ cu. ft. } 4000.1445 \div 24.75 = 161.6\frac{1}{2} + \text{ P., } Ans.$$

$$(2.) 53 \text{ ft. 6 in.} = 53.5 \text{ ft.; } 12 \text{ ft. 6 in.} = 12.5 \text{ ft.; } 53.5 \times 12.5 \times 2 = 1337.5 \text{ cu. ft.} = 54.0404\frac{1}{2} + \text{ P. } 54.0404 \times \$2.25 = \$121.59\frac{1}{2}, Ans.$$

$$(3.) 48\frac{1}{3} \times 16\frac{1}{2} \times 1\frac{1}{2} = \frac{145}{3} \times \frac{33}{2} \times \frac{3}{2} = \frac{14355}{12} = 1196\frac{1}{4} \text{ cu. ft.; } 1196\frac{1}{4} \times 20 = 23925 \text{ bricks, } Ans.$$

$$(4.) 120 \times 8 \times 1\frac{1}{2} = 1440 \text{ cu. ft.} = 2488320 \text{ cu. in. in wall; } 8 \times 4 \times 2.25 = 72 \text{ cu. in. in each brick; } 2488320 \div 72 = 34560 \text{ bricks, } Ans.$$

$$(5.) 240 \times 6 \times 3 = 4320 \text{ cu. ft.} = 7464960 \text{ cu. in. in wall; } 9 \times 4 \times 2 = 72 \text{ cu. in. in brick; } 7464960 \div 72 = 103680 \text{ bricks; } 103680 \div 1000 = 103.68; \$3.25 \times 103.68 = \$336.96, Ans.$$

Art. 263.

$$(1.) 15 \text{ ft.} \times 5 \text{ ft.} \times 4 \text{ ft.} = 300 \text{ cu. ft.} = 518400 \text{ cu. in.; } 518400 \div 2150.4 = 241\frac{1}{2} + \text{ bu., } Ans.$$

$$(2.) 10 \text{ ft.} = 120 \text{ in.; } 5 \text{ ft.} = 60 \text{ in.; } 4 \text{ ft.} = 48 \text{ in.; } 120 \times 60 \times 48 = 345600 \text{ cu. in.; } 345600 \div 231 = 1496\frac{1}{2} + \text{ gal., } Ans.$$

$$(3.) (6)^2 \times .7854 = 28.2744 = \text{area of end; } 28.2744 \times 8 = 226.1952 \text{ cu. ft.} = 390865.3056 \text{ cu. in. This divided by } 2150.4 = 181.76\frac{1}{2} + \text{ bu., } Ans.$$

(4.) $4 \text{ ft.} = 48 \text{ in.}$; $6 \text{ ft.} = 72 \text{ in.}$; $(48)^2 = 2304$; $2304 \times .7854 \times 72 = 130288.4352 \text{ cu. in.}$; $130288.4352 \div 231 = 564.019 + \text{gal.}$; $564.019 + \div 31\frac{1}{2} = 17.9 + \text{bl., Ans.}$

PROGRESSIONS.

ARITHMETICAL PROGRESSION.

CASE I.

Art. 265.

(3.) $50 - 1 = 49$; $49 \times 3 + 2 = 149$, *Ans.*

(4.) $54 - 1 = 53$; $53 \times 2 = 106$; $140 - 106 = 34$, *Ans.*

(5.) $99 - 1 = 98$; $98 \times \frac{7}{8} = 85\frac{3}{4}$; $329 - 85\frac{3}{4} = 243\frac{1}{4}$, *Ans.*

CASE II.

Art. 266.

(2.) $300 - 3 = 297$; $10 - 1 = 9$; $297 \div 9 = 33$, *Ans.*

(3.) $50 - 5 = 45$; $10 - 1 = 9$; $45 \div 9 = 5 \text{ miles}$,
Ans.

CASE III.

Art. 267.

(2.) $50 + 2 = 52$; $52 \times 24 = 1248$; $1248 \div 2 = 624$,
Ans.

(3.) $1 + 12 = 13$; $13 \times 12 = 156$; $156 \div 2 = 78$
strokes, *Ans.*

(4.) The number of terms is evidently 100. The boy travels 6 yards to put the first apple in the basket, 12 the second, and so on; hence, the first term is 6, and the common difference 6. $100 - 1 = 99$; $99 \times 6 + 6 = 600$, last term. $6 + 600 = 606$; $606 \times 100 = 60600$; $60600 \div 2 = 30300 \text{ yd.}$; $30300 \text{ yd.} = 17 \text{ mi. } 69 \text{ rd. } \frac{1}{2} \text{ yd.}$,
Ans.

(5.) Common difference $= 193 \times 2 = 386$ in. $60 - 1 = 59$; $386 \times 59 + 193 = 22967$ in., distance fallen in the last second. 193 in. $+ 22967$ in. $= 23160$ in.; $23160 \times 60 = 1389600$: 1389600 in. $\div 2 = 694800$ in. $= 57900$ ft., *Ans.*

GEOMETRICAL PROGRESSION.

CASE I.

Art. 269.

(3.) $2^{12} = 4096$; $4096 \times 2 = 8192$, *Ans.*

(4.) $4^8 = 65536$; $262144 \div 65536 = 4$, *Ans.*

(5.) Ratio $= 3$; $3^9 = 19683$; $19683 \times 10 = 196830$, *Ans.*

CASE II.

Art. 270.

(2.) $3^6 = 729$; $729 \times 10 = 7290$, last term. $7290 \times 3 = 21870$; $21870 - 10 = 21860$: $21860 \div 2 = 10930$, *Ans.*

(3.) $2^{11} = 2048$; $2048 \times 1 = 2048$, last term. $2048 \times 2 = 4096$; $4096 - 1 = 4095$, and $4095 \div 1 = 4095$, *Ans.*

(4.) $4^{11} \times 4194304$; $4194304 \times 1 = 4194304$, last term. $4194304 \times 4 = 16777216$; $16777216 - 1 = 16777215$; $4 - 1 = 3$; $16777215 \div 3 = 5592405$ ct. $= \$55924.05$, *Ans.*

(5.) $.3 \times 10 = 3$; $10 - 1 = 9$; $3 \div 9 = \frac{1}{3}$, *Ans.*

(6.) Ratio $= 3$; $\frac{1}{3} \times 3 = 1$; $3 - 1 = 2$; $1 \div 2 = \frac{1}{2}$, *Ans.*

(7.) Ratio $= 2$; $\frac{1}{2} \times 2 = 1$; $2 - 1 = 1$; $1 \div 1 = 1$, *Ans.*



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